

# **EVALUATION OF 2011 DSM PROGRAMS**

## **EXECUTIVE SUMMARY**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

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**ECONOLER**

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# 1 DSM PORTFOLIO PERFORMANCE

## 1.1 OVERVIEW

This document provides a summary of the evaluation of the 2011 electric demand-side management (DSM) programs carried out in Nova Scotia (NS). Econoler was mandated to conduct this evaluation for Efficiency Nova Scotia Corporation (ENSC). Established in 2010, ENSC is an independent organization in charge of helping Nova Scotians improve the energy efficiency of their homes and workplaces.

For the 2011 program year, Econoler conducted impact and process evaluations for the following programs.

**Table 1: Type(s) of Evaluation Conducted per Program**

| Program                                           | Type(s) of Evaluation |        |
|---------------------------------------------------|-----------------------|--------|
|                                                   | Process               | Impact |
| Appliance Retirement (ARet) program               | x                     | x      |
| Appliance Replacement (AREp) program              | x                     | x      |
| Retail Markdown Program (RMP)                     | x                     | x      |
| LED Holiday Light Exchange (LHLE) program         |                       | x      |
| Low Income Renter (LIR) program                   | x                     | x      |
| Multi-Unit Residential Renter (MURR) program      | x                     | x      |
| Efficient Products-Direct Install (EP-DI) program | x                     | x      |
| EnerGuide for Existing Houses (EEH) program       | x                     | x      |
| Fuel Substitution pilot                           | x                     | x      |
| Low Income program                                | x                     | x      |
| Performance Plus program                          |                       | x      |
| Business Energy Rebates (BER) program             | x                     | x      |
| Smart Lighting Choices (SLC) program              |                       | x      |
| Custom (C&IC) program                             | x                     | x      |
| Small Business Energy Solutions (SBES) program    | x                     | x      |



It is the opinion of Econoler that the portfolio of programs evaluated in 2011 was run efficiently and at a satisfactory level overall, especially given the fact that ENSC is a young organization which has not been managing the programs for very long. Indeed, before October 2010, Nova Scotia Power Incorporated (NSPI) was the DSM program administrator. In spite of this change in responsibility, ENSC still managed to maintain all programs that existed in 2010 while also establishing new programs to test unexplored markets.

In 2011, ENSC's program portfolio achieved a total of 141.751 GWh in energy savings and 28.864 in demand savings, which is a substantial increase compared to 2010 (82.45 GWh and 15.85 MW). The achievement of such savings came mainly through improving program design and implementation. Notably, the program portfolio in 2011 covered a wider range of energy efficiency measures. Moreover, the marketing efforts deployed in 2011 have had a positive impact on the number of participants. Indeed, for many programs, there was an increase in the participation level in comparison to 2010. That being said, program marketing and communication still represent an area for improvement.

The current report aims at presenting the impact and process evaluation results of the 15 programs offered in 2011 by ENSC. The following sections detail the achieved savings, followed by an in-depth analysis of individual program performance. The evaluation methodology as well as recommendations to enhance the portfolio of programs are also featured in this report.

## 1.2 ACHIEVED SAVINGS

The energy savings achieved by ENSC's portfolio of DSM programs were 11 percent lower than the 2011 program targets with a total of 141.751 GWh at the generator. The demand savings were also slightly lower than established targets, totaling 28.864 MW. These results show some individual programs exceeding goals and others falling short. Specific observations regarding each program are provided in this section.

The following table illustrates the savings targets revised in July 2011, the savings tracked internally by ENSC and the evaluated results for each program offered by ENSC in 2011.

**Table 2: 2011 Savings Targets, Tracked Savings and Evaluated Results for Each Program  
(Net Energy and Demand Savings at the Generator)**

| DSM PROGRAM                 | 2011 Energy Savings (GWh) |                 |                   | 2011 Demand Savings (MW) |                 |                   |
|-----------------------------|---------------------------|-----------------|-------------------|--------------------------|-----------------|-------------------|
|                             | Targets                   | Tracked Savings | Evaluated Savings | Targets                  | Tracked Savings | Evaluated Savings |
| <b>RESIDENTIAL PROGRAMS</b> |                           |                 |                   |                          |                 |                   |
| Efficient Products Programs |                           |                 |                   |                          |                 |                   |
| ARet program                | 7.27                      | 4.189           | <b>7.175</b>      | 1.16                     | 0.668           | <b>1.144</b>      |
| ARep program                | 0.96                      | 0.268           | <b>0.548</b>      | 0.11                     | 0.032           | <b>0.065</b>      |
| RMP                         | 15.52                     | 17.821          | <b>13.802</b>     | 1.56                     | 1.793           | <b>1.388</b>      |
| LHLE program                | -                         | 1.827           | <b>1.447</b>      | -                        | 9.136           | <b>3.618</b>      |
| LIR program                 | 4.38                      | 5.156           | <b>4.809</b>      | 0.98                     | 1.156           | <b>1.078</b>      |
| MURR program                | 0.55                      | 0.616           | <b>0.651</b>      | 0.09                     | 0.098           | <b>0.104</b>      |
| EP-DI program               | 18.59                     | 29.435          | <b>25.792</b>     | 1.87                     | 2.961           | <b>2.593</b>      |
| EEH program                 |                           | 6.465           | <b>4.805</b>      |                          | 2.452           | <b>1.543</b>      |
| Fuel Substitution pilot     | 7.80                      | 1.300           | <b>1.570</b>      | 2.14                     | 0.641           | <b>0.785</b>      |
| Low Income program          | 4.70                      | 7.082           | <b>7.636</b>      | 1.00                     | 1.513           | <b>1.632</b>      |
| Performance Plus program    | 2.60                      | 1.356           | <b>2.454</b>      | 0.79                     | 0.717           | <b>0.861</b>      |
| <b>RESIDENTIAL TOTAL</b>    | <b>62.37</b>              | <b>75.515</b>   | <b>70.689</b>     | <b>9.70</b>              | <b>21.167</b>   | <b>14.811</b>     |
| <b>C&amp;I PROGRAMS</b>     |                           |                 |                   |                          |                 |                   |
| BER program                 | 21.80                     | 7.112           | <b>7.002</b>      |                          | 1.483           | <b>1.419</b>      |
| SLC program                 | 8.04                      | 7.730           | <b>7.954</b>      | 6.52                     | 2.267           | <b>2.050</b>      |
| C&IC program                | 47.80                     | 32.565          | <b>32.930</b>     | 10.42                    | 3.554           | <b>3.764</b>      |
| SBES program                | 18.48                     | 26.080          | <b>23.176</b>     | 4.27                     | 7.682           | <b>6.820</b>      |
| <b>C&amp;I TOTAL</b>        | <b>96.12</b>              | <b>73.487</b>   | <b>71.062</b>     | <b>21.21</b>             | <b>14.985</b>   | <b>14.053</b>     |
| <b>PORTFOLIO TOTAL</b>      | <b>158.49</b>             | <b>149.002</b>  | <b>141.751</b>    | <b>30.91</b>             | <b>36.153</b>   | <b>28.864</b>     |

The 2011 targets, as revised and discussed with ENSC's Program Development Working Group (PDWG) in July 2011, were presented into larger categories regrouping all programs offered by ENSC in 2011. The following table details these targets by larger categories in comparison with the evaluated results.

**Table 3: 2011 Savings Targets Presented to the PDWG and Evaluated Results**

| DSM PROGRAM                                | 2011 Targets  |              | 2011 Evaluated Results |               |
|--------------------------------------------|---------------|--------------|------------------------|---------------|
|                                            | GWh           | MW           | GWh                    | MW            |
| <b>RESIDENTIAL PROGRAMS</b>                |               |              |                        |               |
| Efficient Products <sup>a</sup>            | 42.89         | 4.79         | 49.415                 | 8.912         |
| EnerGuide for Existing Houses <sup>b</sup> | 7.80          | 2.14         | 6.375                  | 2.328         |
| Low Income <sup>c</sup>                    | 9.08          | 1.98         | 12.445                 | 2.710         |
| Performance Plus (New Houses)              | 2.60          | 0.79         | 2.454                  | 0.861         |
| <b>RESIDENTIAL TOTAL</b>                   | <b>62.37</b>  | <b>9.70</b>  | <b>70.689</b>          | <b>14.811</b> |
| <b>C&amp;I PROGRAMS</b>                    |               |              |                        |               |
| Prescriptive <sup>d</sup>                  | 29.84         | 6.52         | 14.956                 | 3.469         |
| Custom                                     | 47.80         | 10.42        | 32.930                 | 3.764         |
| Small Business Energy Solutions            | 18.48         | 4.27         | 23.176                 | 6.820         |
| <b>C&amp;I TOTAL</b>                       | <b>96.12</b>  | <b>21.21</b> | <b>71.062</b>          | <b>14.053</b> |
| <b>PORTFOLIO TOTAL</b>                     | <b>158.49</b> | <b>30.91</b> | <b>141.751</b>         | <b>28.864</b> |

<sup>a</sup>Including all Efficient Products programs except for the Low Income Renter program

<sup>b</sup>Including the Fuel Substitution pilot

<sup>c</sup>Including the Low Income Renter program

<sup>d</sup>Including the BER and SLC programs

### Appliance Retirement Program

The net savings achieved by the ARet program greatly exceeded those tracked by ENSC by 71 percent. This result was mainly due to the revision of the unitary savings values for each type of appliance. For refrigerators and freezers, the review was based on metering data, which took into account the actual condition of the old appliances retired and their degradation over time. For dehumidifiers and room air conditioners, Econoler used the results from a metering study conducted in Ontario for the evaluation of the Every Kilowatt Counts program.

### Appliance Replacement Program

The net evaluated savings from the ARep program more than doubled with relation to the net evaluated savings tracked by ENSC. The upward revision of the unitary savings value for refrigerators, based on metering data from the ARet program, explains this result.

**Retail Markdown Program**

In the case of the RMP, the net evaluated savings fell short of those tracked by ENSC by 23 percent. The main element that explains this result is the difference between the net-to-gross ratio (NTGR) used for the evaluation and that used in the tracking sheet, which was estimated at a value above 1. Moreover, the inclusion of a replacement ratio and an in-service rate for regular CFLs as well as interactive effects for lighting products reduced the energy impact of the program but allowed for a more precise evaluation of savings. Nonetheless, for several products, Econoler revised upward the unitary savings value.

Survey results showed that program awareness had dropped among participants and non-participants in 2011 compared to 2010. Indeed, fewer participants and non-participants recalled seeing in-store promotions or discounts offered during the two markdown periods. The relatively low level of promotion and discount awareness is consistent with information collected during the in-store visits. This finding can explain the important level of free-ridership measured for CFLs and, hence, why evaluated savings were lower than tracked savings in 2011.

**Low Income Renter Program**

The impact evaluation of the LIR program also revealed net savings that fell short of those tracked by ENSC by 7 percent. The addition of interactive effects and an installation rate for power bars with integrated timer are the main factors that explain this result. The line loss factor for the residential sector was also updated for 2011. Moreover, while some adjustments were applied to the unitary savings estimates used in the tracking sheet, they were in most cases revised upward.

**Multi-Unit Residential Renter Program**

The MURR program net evaluated savings exceeded those tracked by ENSC by 6 percent. The addition of interactive effects factors for lighting product replacements, pipe insulation and hot water tank wraps and the upward revision of the unitary savings values for CFLs, programmable thermostats, faucet aerators and low-flow showerheads are the main factors that explain this difference.

**Efficient Products – Direct Install Program**

The net energy savings obtained through the EP-DI evaluation fell short of those tracked by ENSC by 12 percent. The adjustments applied to some unitary savings values, such as for commercial thermostats, as well as the consideration of interactive effects explain this difference. Even though the program evaluation NTGRs were revised upward to 0.94 for EP-DI products and to 1 for the Retail LED Direct Install pilot project, compared to 0.81 and 0.9 respectively for tracked savings, the additional savings were not enough to compensate for the impact of the necessary adjustments mentioned.

**EnerGuide for Existing Houses Program**

The evaluated net energy savings are lower than those tracked by ENSC by approximately 26 percent. This difference is mainly due to the adjustment made to the energy savings per EnerGuide point, from 1,047 kWh to 817 kWh. Econoler performed simulation billing calibration analyses for fine-tuning the value of annual savings per EnerGuide point, which resulted in this downward adjustment. In addition, a number of unitary savings values related to the implementation of prescriptive measures were modified in accordance with up-to-date studies conducted in other jurisdictions. Furthermore, Econoler made slight adjustments to the savings generated by the two pilot projects (Direct Install Standard and Direct Install Plus). Most of the unitary savings values used for the calculation of the two pilot project savings were revised upward.

**Fuel Substitution Pilot**

The impact evaluation of the Fuel Substitution pilot revealed net savings higher than those tracked by ENSC. The difference between the NTGR used for the evaluation and in the tracking sheet explains this result.

**Low Income Program**

The net evaluated savings of the Low Income program met those tracked by ENSC by 8 percent. The addition of interactive effects for lighting and domestic hot water heating measures is the main factors that explain this difference. Nevertheless, before calculation of the interactive effects, the Evaluator had adjusted the initial gross savings upwards as a result of a number of modifications to prescriptive measure unitary savings values. Among all the prescriptive measures included in this program, the adjustments to the unitary savings of lighting products (CFLs and LEDs), programmable thermostats and low-flow fittings (faucet aerators and low-flow showerheads) are those that had the most relevant impact on overall gross energy and demand savings.

**Performance Plus Program**

For the Performance Plus program, the evaluation calculated net energy savings exceeded those tracked by ENSC by 81 percent. This is mainly due to the adjustment of the house rating baseline value used for calculating the savings per EnerGuide point, from 80 to 78. In addition, the NTGR calculated for 2011 (0.73) is higher than the one calculated as part of the 2010 program evaluation (0.46) and used to track savings. Despite the fact that ENSC and Econoler used the same energy-to-demand ratio, the net demand savings met those tracked by ENSC as opposed to an overachievement of the energy savings of 81 percent. The reason for this is that Econoler adjusted significantly the unitary peak demand savings related to the installation of electric thermal storage systems (reduction of tracked demand savings by approximately 75% for this system).

**Business Energy Rebates Program**

For the BER program, the net evaluated energy savings were slightly lower than those tracked by ENSC by 1.5 percent. This can be explained by adjustments calculated from on-site visits and applied to the tracked gross savings as well as by the interactive factor of -7.7 percent applied to the savings. The NTGR used for the evaluation was higher than the one used for tracked savings. However, this increase was not sufficient to overcome the reduction in energy savings resulting from the adjustments.

**Smart Lighting Choices Program**

The net energy savings of the SLC program were slightly higher than those tracked by ENSC by 3 percent. This can be explained by the increase in hours of operation that was applied to energy savings calculations for SLC products. This increase was sufficient to overcome the reduction caused by the interactive effects factor applied to the gross savings and by the difference between the NTGR calculated for the SLC program (0.81) and the one used in the tracked savings (0.84).

**Custom Program**

The evaluated net energy savings of the C&IC and CINC programs are slightly higher than those tracked by ENSC by 1 percent. This difference is mainly due to the improvement of the free-ridership level, from 10 percent in 2010 to 7 percent for the 2011 evaluation. This difference in the free-ridership level is due in part to the enhanced screening process put in place by ENSC. This process was improved with all participants who signed the PDA in 2011.

With regard to the net demand savings, the evaluated values are higher than those tracked by ENSC. The reason for this is that Econoler adjusted upward a number of diversity factors used for computing the peak demand savings of sample projects, based on equipment operations and specifications. Econoler considered that the diversity factors used by ENSC were sometimes too conservative, especially for the lighting retrofit projects.

**Small Business Energy Solutions Program**

The net evaluated savings for the SBES program fell short of those tracked by ENSC by 11 percent. These results can be explained by the interactive effects factor calculated for lighting products installed in regular spaces. This factor resulted in a 7.7 percent reduction of gross savings. Moreover, the NTGR calculated for the evaluation was slightly lower than the value used for tracked savings.

### 1.3 OVERALL PORTFOLIO ANALYSIS

In addition to the performance of individual programs, it is worth looking at individual programs' contributions over the years from a more global perspective. The table below shows the evaluated contribution of each program to total portfolio savings between 2008 and 2011.

**Table 4: Program Performance as Percentage of Total Portfolio**

| DSM PROGRAM                  | Percentage of<br>Portfolio Savings<br>2008 |              | Percentage of<br>Portfolio Savings<br>2009 |              | Percentage of<br>Portfolio Savings<br>2010 |              | Percentage of<br>Portfolio Savings<br>2011 |              |
|------------------------------|--------------------------------------------|--------------|--------------------------------------------|--------------|--------------------------------------------|--------------|--------------------------------------------|--------------|
|                              | Energy                                     | Demand       | Energy                                     | Demand       | Energy                                     | Demand       | Energy                                     | Demand       |
| <b>RESIDENTIAL PROGRAM</b>   |                                            |              |                                            |              |                                            |              |                                            |              |
| ARet program                 | --                                         | --           | --                                         | --           | 3.0%                                       | 3.0%         | 5.1%                                       | 4.0%         |
| ARep program                 | --                                         | --           | --                                         | --           | --                                         | --           | 0.4%                                       | 0.2%         |
| RMP                          | 28.0%                                      | 27.0%        | 10.0%                                      | 15.0%        | 12.0%                                      | 14.0%        | 9.7%                                       | 4.8%         |
| LHLE program                 | --                                         | --           | --                                         | --           | --                                         | --           | 1.0%                                       | 12.5%        |
| LIR program                  | --                                         | --           | --                                         | --           | --                                         | --           | 3.4%                                       | 3.7%         |
| MURR program                 | --                                         | --           | --                                         | --           | --                                         | --           | 0.5%                                       | 0.4%         |
| EP-DI program                | 35.0%                                      | 34.0%        | 50.0%                                      | 51.0%        | 30.0%                                      | 32.0%        | 18.2%                                      | 9.0%         |
| EEH program                  | --                                         | --           | 5.0%                                       | 5.0%         | 10.0%                                      | 13.0%        | 3.4%                                       | 5.3%         |
| Fuel Substitution<br>pilot   | --                                         | --           | --                                         | --           | --                                         | --           | 1.1%                                       | 2.7%         |
| Low Income program           | --                                         | --           | 3.0%                                       | 3.0%         | 1.0%                                       | 2.0%         | 5.4%                                       | 5.7%         |
| Performance Plus<br>program  | --                                         | --           | 1.0%                                       | 1.0%         | 1.0%                                       | 5.0%         | 1.7%                                       | 3.0%         |
| <b>RESIDENTIAL<br/>TOTAL</b> | <b>63.0%</b>                               | <b>61.0%</b> | <b>69.0%</b>                               | <b>75.0%</b> | <b>57.0%</b>                               | <b>69.0%</b> | <b>49.9%</b>                               | <b>51.3%</b> |
| <b>C&amp;I PROGRAMS</b>      |                                            |              |                                            |              |                                            |              |                                            |              |
| BER program                  | --                                         | --           | --                                         | --           | 1.0%                                       | 1.0%         | 4.9%                                       | 4.9%         |
| SLC program                  | --                                         | --           | 9.0%                                       | 8.0%         | 7.0%                                       | 7.0%         | 5.6%                                       | 7.1%         |
| C&IC program                 | 30.0%                                      | 27.0%        | 15.0%                                      | 11.0%        | 23.0%                                      | 14.0%        | 23.2%                                      | 13.0%        |
| SBES program                 | 7.0%                                       | 11.0%        | 7.0%                                       | 8.0%         | 13.0%                                      | 9.0%         | 16.4%                                      | 23.6%        |
| <b>C&amp;I TOTAL</b>         | <b>37.0%</b>                               | <b>38.0%</b> | <b>31.0%</b>                               | <b>27.0%</b> | <b>44.0%</b>                               | <b>31.0%</b> | <b>50.1%</b>                               | <b>48.7%</b> |

The commercial and industrial sectors account for half of total portfolio energy and demand savings and have increased their contribution to the program portfolio since 2008. Nevertheless, the number of participants associated with most of the residential programs has increased in 2011. Indeed, most of the programs that exceeded the net savings tracked by ENSC operated in the residential market: the ARet, ARep, MURR, Low Income and Performance Plus programs, as well as the Fuel Substitution pilot, have all reached or exceeded the net savings targeted by ENSC. The SLC and C&IC programs were the only C&I programs to have done the same.

In 2011, programs were launched as pilots while several pilot projects were integrated into existing or new programs. For example, the Fuel Substitution pilot as well as the MURR and LIR programs were launched as pilots in 2011. These three programs all targeted different markets. For instance, the LIR program was meant to test a market that had not been explored yet and address various needs pinpointed by stakeholders of the low-income market. These pilot programs had great success in 2011. Even though some of them, such as the MURR program and the Fuel Substitution pilot, will be reconfigured for 2012, they provided ENSC with experience and knowledge of their respective markets. It is to be noted also that the Appliance Replacement program has been discontinued for 2012.

Several pilot projects were also integrated into existing programs in 2011. Indeed, the EEH, MURR, RMP and Low Income programs claimed energy savings through many different pilot projects. In some cases, these initiatives were used as a tool for facilitating the enrollment of participants in other program components.

In 2010, the program portfolio sought to diversify its sources for achieving savings by expanding the range of energy efficiency measures that it incentivized, notably by including light fixtures, various controls and appliances to the RMP. In 2011, products and measures other than lighting were added to certain programs in order to increase the variety offered to participants. This is the case for the EP-DI program, which included for the first time products other than lighting. Besides CFLs, it promoted power bars with integrated timer, hot water tank wraps and programmable thermostats. ENSC is planning to maintain this diversification approach through 2012.

It is important to recognize that in previous years, the portfolio performance relied heavily on the programs that promoted lighting products. In 2011 and for the years to come, ENSC took and will take action to diversify its portfolio of programs with the addition of pilot programs and projects promoting new products or measures as a means to enhance its offerings.

The 2011 evaluation allowed the Evaluator to conclude that ENSC's DSM portfolio was quite complete. Indeed, besides existing programs, new programs were set up in 2011 to test more defined and unexplored markets among the generic residential, commercial and industrial markets. The LIR, MURR and Fuel Substitution pilot programs carried this objective.

However, the programs need to be well adapted to the market in which they operate. The Evaluator experienced difficulty in evaluating energy savings for some of the programs because the latter did not promote all the right products for the market they meant to reach. The EP-DI program is a great example in this regard. In 2011, the same products could be installed for both multi-unit apartments and common areas, but savings are evaluated differently for commercial and residential uses. It would be better if ENSC defined the product offer relative to each program in order to ensure that it concurs with the targeted market or clientele. This would allow a more uniform evaluation, where adjustment factors and NTGR can be adequately applied across all products or measures of a same program. The same observation applies to pilot projects as they should be developed in consideration of program characteristics.



## **2 EVALUATION OBJECTIVES & METHODOLOGY**

### **2.1 EVALUATION OBJECTIVES**

The main objectives of the 2011 evaluation of ENSC's DSM programs were as follows:

- > evaluate the program processes based on their respective objectives;
- > determine the gross and net savings of each program; and
- > identify recommendations to improve program performance.

### **2.2 METHODOLOGY**

#### **2.2.1 Process Evaluation**

The 2011 process evaluation of ENSC's DSM programs relied on the analysis of program documentation, which included the ENSC website, the 2010 evaluation report (when applicable), the program manual and the tracking system. Once this key program information was reviewed, in-depth interviews were conducted with the Program Manager (PM) and program partners. Finally, telephone surveys were conducted with program participants and, in the case of the RMP, with non-participants.

## 2.2.2 In-Depth Interviews

The 2011 evaluation methodology included in-depth interviews with program staff as well as with different program partners. Between September 2011 and November 2011, Econoler conducted 76 in-depth interviews with various stakeholders including: PMs, delivery agents, contractors, distributors and participants. These included 15 interviews with PMs, 13 interviews with delivery agents, 13 interviews with contractors (including an outreach agent, verification partners, energy auditors and electricians), 10 interviews with distributors, 10 interviews with builders, six interviews with retailers and nine in-depth interviews with program participants. A summary of the interviews completed for each program is presented in the table below.

**Table 5: 2011 In-Depth Interviews**

| Program           | In-Depth Interviews Completed in 2011 |                 |             |              |           |           |              |
|-------------------|---------------------------------------|-----------------|-------------|--------------|-----------|-----------|--------------|
|                   | Program Managers                      | Delivery Agents | Contractors | Distributors | Builders  | Retailers | Participants |
| ARet              | 1                                     | 1               | 2           | --           | --        | --        | --           |
| ARep              | 1                                     | --              | --          | --           | --        | 1         | --           |
| RMP               | 1                                     | 1               | --          | --           | --        | 5         | --           |
| LIR               | 1                                     | 1               | 1           | --           | --        | --        | --           |
| MURR              | 1                                     | 1               | --          | --           | --        | --        | --           |
| EP-DI             | 1                                     | 1               | --          | --           | --        | --        | --           |
| EEH               | 1                                     | 2               | 2           | --           | --        | --        | --           |
| Fuel Substitution | 1                                     | --              | --          | --           | --        | --        | --           |
| Low Income        | 1                                     | 3               | 1           | --           | --        | --        | --           |
| Performance Plus  | 1                                     | --              | --          | --           | 10        | --        | --           |
| BER               | 1                                     | --              | --          | --           | --        | --        | 4            |
| SLC               | 1                                     | --              | 1           | 10           | --        | --        | --           |
| C&IC              | 2                                     | --              | 2           | --           | --        | --        | 5            |
| SBES              | 1                                     | 3               | 4           | --           | --        | --        | --           |
| <b>Total</b>      | <b>15</b>                             | <b>13</b>       | <b>13</b>   | <b>10</b>    | <b>10</b> | <b>6</b>  | <b>9</b>     |

### 2.2.3 On-Site Visits

For the 2011 evaluations, Econoler visited a total of 115 participant sites and 10 retail stores. These visits were conducted between October 2011 and December 2011 for all programs. The objective of the participant site visits was to collect data such as installation rates, hours of operation and interactive effects to perform all necessary engineering analyses used to determine each program's gross energy and demand savings. The objective of the 10 retail store visits conducted under the evaluation of the RMP was to provide the qualitative information required to depict the in-store experience of the client. "Mystery shopper" visits and observations allowed for an assessment of the effectiveness of the instant discounts awarded at the counter, the product promotional displays and the knowledge of products and the program on the part of employees. The complete results of the site work are provided in the individual program reports.

**Table 6: 2011 On-Site Visits**

| Program           | On-Site Visits Completed in 2011 |                 |
|-------------------|----------------------------------|-----------------|
|                   | Participant Sites                | Retailer Stores |
| ARet              | 2                                | --              |
| AREp              | 2                                | --              |
| RMP               | --                               | 10              |
| LIR               | 15                               | --              |
| MURR              | 5                                | --              |
| EP-DI             | 15                               | --              |
| EEH               | 2                                | --              |
| Fuel Substitution | 8                                | --              |
| Low Income        | 3                                | --              |
| Performance Plus  | 2                                | --              |
| BER               | 11                               | --              |
| C&IC              | 25                               | --              |
| SBES              | 15                               | --              |
| <b>Total</b>      | <b>115</b>                       | <b>10</b>       |

## 2.2.4 Participant Surveys

A total of 761 interviews with 2011 program participants and 70 interviews with non-participants (Table 7) were completed for this evaluation. Although the content of the surveys varied widely, the survey instruments were used to capture information such as satisfaction with the program and the measures installed, verification of actions recorded in program tracking databases, free-ridership, internal spillover, participant and non-participant motivations and barriers as well as recommendations for program improvements. The interviews were conducted between September 2011 and December 2011 utilizing computer-assisted telephone interviewing (CATI). The RMP surveys utilized random digit dial (RDD) samples of residential telephone numbers in Nova Scotia to reach non-participants, and participants in the remaining programs were surveyed utilizing contact information provided by ENSC.

**Table 7: 2011 Telephone Surveys**

| Program           | Surveys Completed in 2011 |                  |
|-------------------|---------------------------|------------------|
|                   | Participants              | Non-Participants |
| ARet              | 90                        | --               |
| RMP               | 71                        | 70               |
| LIR               | 70                        | --               |
| MURR              | 30                        | --               |
| EP-DI             | 70                        | --               |
| EEH               | 70                        | --               |
| Fuel Substitution | 70                        | --               |
| Low Income        | 70                        | --               |
| Performance Plus  | 70                        | --               |
| BER               | 43                        | --               |
| C&IC              | 46                        | --               |
| SBES              | 61                        | --               |
| <b>Total</b>      | <b>761</b>                | <b>70</b>        |

### **2.2.5 Impact Evaluation**

The impact evaluations integrated findings from the telephone surveys, program data from the tracking system, on-site visits and/or interviews with program partners, depending on the type of data collection activities considered necessary. The results from a metering activity conducted for refrigerators and freezers were used in the impact evaluation of the ARet and ARep programs. The EEH, Performance Plus and Low Income evaluations also drew upon HOT2000<sup>1</sup> simulation calibration analyses.

Furthermore, a billing analysis was also developed for the LIR program. Unfortunately, the number of participants with electrical heating and an acceptable number of billing periods post-implementation were too low and results could not be used for savings verification. The 2010 verification study suggested moving to billing analysis whenever possible, but program approaches and the short timeline of the evaluation made this difficult. Still, a billing analysis could be useful for specific issues and provide ENSC with complementary information to more accurately estimate savings in some instances. Recommendations presented for specific programs in the following sections include ways in which the billing analysis could support ENSC in future evaluations.

The 2010 verification study also mentioned contemplating a dual baseline approach in 2011. The dual baseline requires considering the remaining useful life of the product being replaced in order to calculate the cumulative savings associated with its replacement with a more efficient product. Different jurisdictions have addressed early replacement in different ways. The New York Department of Public Service Commission has adopted an approach that employs a series of simple look-up tables that provide adjustment factors applied to the full costs and benefits based on the remaining useful life of the measure. Others like the Regional Technical Forum (RTF)<sup>[1]</sup> use the pre-conditions baseline in calculating savings and the full cost of the measure is used in determining cost-effectiveness; i.e., no adjustments are made to either benefits or costs. California, which has not yet adopted an approach to early replacement, appears to be moving in the same direction, as does New York. Other states like Pennsylvania and Maryland continue to wrestle with this issue. In summary, while early replacement is an important issue, there is no consensus as of yet on how best to address the matter.

Thus, for this evaluation, because of the complexity of the early replacement situation and due to time constraints, early replacement situations were not addressed. It is important to address this issue carefully with ENSC in order to better understand where dual baselines could be implemented across

<sup>1</sup> HOT2000 is residential energy analysis software approved by Natural Resources Canada for calculating EnerGuide ratings. This software was developed by the Housing, Buildings, Communities and Simulation (HBCS) group of CanmetENERGY, a division of Natural Resources Canada.

For additional information: [http://198.103.48.154/eng/software\\_tools/hot2000.html](http://198.103.48.154/eng/software_tools/hot2000.html).

[1] The RTF provides more general guidance and relies on programs operated by individual utilities, Bonneville Power Administration (BPA), the Energy Trust of Oregon (ETO) and Northwest Energy Efficiency Alliance (NEEA) to implement this guidance in estimating savings.

its program portfolio. Programs which promote a wide range of products and measures in the residential sector might not be good candidates for this approach because of the difficulty to obtain the necessary information through customers. For commercial programs where regular exchanges between customers and ENSC are required, a dual baseline approach could be put in place. Following this evaluation, discussions should be held with ENSC to clearly define where a dual baseline is realistic and how it can be implemented for future evaluations.

For all programs, interactive effects factors as well as NTGRs that incorporated levels of free ridership and, in some cases spillover, were applied to the gross savings impacts in order to estimate net savings impacts.

The estimation of NTGRs for the 2011 evaluation of ENSC's programs relies on a self-report approach. A level of free-ridership was obtained for most programs evaluated either through telephone surveys or in-depth interviews. When compared to the free-ridership assessments of the previous years, the Evaluator's approach to estimating the program free-ridership level preserved the key elements that were applied from 2008 to 2010. However, the following enhancements were incorporated into this year's free-ridership evaluation methodology:

- > A 0 to 10 scoring system was introduced rather than fixed categories that were assigned weights.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participants' energy efficiency decision making rather than focusing narrowly only on their rating of program importance. This question structure more accurately reflects the complex nature of the real-world decision making and helps ensure that the most relevant non-program influences are considered in the free-ridership assessment in addition to program influences.

Noteworthy is that the Evaluator's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York State, Oregon and Pennsylvania. In addition, this approach is in line with one of the many methodologies to estimating free-ridership that were discussed at a PDWG meeting held in May 2010 for developing a Nova Scotia NTGR protocol.

The table below summarizes the free-ridership levels calculated during the 2010 and 2011 evaluations for each program.

**Table 8: Free-Ridership Levels**

|                          | Program         | Free-Ridership Levels |       |
|--------------------------|-----------------|-----------------------|-------|
|                          |                 | 2010                  | 2011  |
| <b>ARet</b>              | Refrigerators   | 31%                   | 20%   |
|                          | Freezers        | 18%                   | 26%   |
|                          | Dehumidifiers   | 47%                   | 21%   |
|                          | Room AC units   | --                    | 0%    |
| <b>AREp</b>              |                 | --                    | --    |
|                          | Regular CFLs    | --*                   | 78%   |
| <b>RMP</b>               | Refrigerators   | 72%                   | 17%   |
|                          | Clothes Washers | 85%                   | 53%   |
| <b>LIR</b>               |                 | --                    | --    |
| <b>MURR</b>              |                 | --                    | 17%   |
| <b>EP-DI</b>             |                 | 17.5%                 | 15.4% |
| <b>EEH</b>               |                 | 24%                   | 31%   |
| <b>Fuel Substitution</b> |                 | --                    | 42%   |
| <b>Low Income</b>        |                 | --                    | --    |
| <b>Performance Plus</b>  |                 | 54%                   | 32%   |
| <b>BER</b>               |                 | 46%                   | 17.6% |
| <b>C&amp;IC</b>          |                 | 10%                   | 7%    |
| <b>SBES</b>              |                 | 13.6%                 | 12.8% |

\* In 2010, the free-ridership level for CFLs sold through the RMP was integrated with the spillover in a global NTGR.

### 3 OVERALL RECOMMENDATIONS

This section presents general recommendations for the program portfolio. These recommendations are generally considered as good practices and can be applied to most ENSC programs. They are aimed specifically at enhancing program documentation, data management and program evaluation.

#### 3.1 PROGRAM MANUAL

Program manuals feature key information on program process and tracking for internal use and are an essential reference tool for all program staff. In addition, program manuals are widely used by the Evaluator throughout the program process and impact evaluation activities. They are usually custom-designed to meet an organization's specific needs. For the same organization, the program manual contents might vary by program. However, a certain amount of basic information is typically included in program manuals intended for internal use.

Econoler has analyzed the ENSC program manuals. Although they contained relevant information useful for both the PM and the Evaluator, Econoler found that important components were missing. Therefore, Econoler has the following recommendations, where applicable, to supplement and improve the tool:

**Table 9: General Recommendations on ENSC Program Manuals**

| No.    | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OV-R1. | <b>Provide a “base case”:</b> The program manuals do not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as the operating time, wattage, base consumption, replacement ratio and installation rate. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                        |
| OV-R2. | <b>Provide the parameters used to estimate the program objectives:</b> After estimating the gross savings from the base case established in the program manuals, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manuals should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |



- OV-R3. Include cost-effectiveness test results in the program manuals:** Although the cost-effectiveness tests of the programs are calculated and included in the DSM plan, the results should be included in the program manuals to provide completeness and standardization as well as to serve as program memory for current and future PMs.
- OV-R4. Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manuals. The plans should also identify for each activity the performance indicators that should be collected for monitoring and evaluation purposes.
- OV-R5. Complete the program manuals to keep track of changes and standardize the content:** The program manuals are well written but important information is missing that would serve as “program memory” in case of modifications or staff changes. The content of the program manuals should be regularly updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

## 3.2 PROGRAM DATA TRACKING

Data tracking and reporting are crucial for program management as well as for evaluation purposes. In 2010, ENSC implemented an online Demand Side Management Data System (DSMDS). This centralized system allows the tracking of all projects for each program. This initiative meant to address data tracking issues identified in previous evaluations and is a great asset to ENSC. However, additional work is still needed to fine-tune the system. Indeed, the DSMDS was not used much by the Evaluator in 2011 since it was more challenging to extract data from this system than directly using the supplemental program tracking sheets provided by ENSC. That being said, ENSC is working on the DSMDS to improve the tool. Econoler strongly supports ENSC's work to provide a more accessible tool and to ensure that the information is up to date. The Evaluator has the following general recommendations regarding data tracking:

**Table 10: General Recommendations on Program Data Tracking**

| <b>No.</b>    | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OV-R6.</b> | <b>Adjust the tracked savings on the basis of the evaluation results:</b> In order to provide a more precise estimation of savings, ENSC should track the gross and net savings of each program on the basis of the most recent evaluation. For instance, the unitary savings values should be adjusted each year to the values established by the impact evaluation. Moreover, the tracking sheet should include all the parameters used by the Evaluator to estimate the gross and net savings, namely installation rates, replacement ratios, partial use factors, interactive effects, free-ridership, spillover, etc. |
| <b>OV-R7.</b> | <b>Prioritize the use of average unitary savings values:</b> For residential programs, ENSC should prioritize the use of average unitary savings values instead of calculating savings case by case, based on the real specifications of the old and new products. This would allow a much simpler tracking of savings and facilitate adjustments when needed. However, when possible, ENSC should continue collecting the specifications of the old and new products such as the wattage or the efficiency level. This information stays relevant for the impact evaluation.                                              |
| <b>OV-R8.</b> | <b>Establish protocols for data tracking:</b> Clear protocols and standards for entering and tracking program data should be established. This should be documented in program manuals and explained during training to all relevant staff members. ENSC would benefit from standardizing the data tracking across all programs.                                                                                                                                                                                                                                                                                           |

- OV-R9. Automate the entries and develop a validation process:** Routine functions and data entries should be automated and standardized as much as possible. Moreover, a validation process should be developed by ENSC to ensure that incorrect values are not entered in the tracking sheet.
- OV-R10. Supplement the data tracking system for evaluation purposes:** Information likely to be needed for project assessments should be incorporated into the data tracking system when possible (e.g., project description, historical billing data, participant's rate code, percentage of electric space heating, presence of air conditioning unit or system, wattage information, etc.). This will allow for a more precise evaluation of savings.

### 3.3 EVALUATION PLAN

The evaluation plan identifies key variables that must be collected as part of program operations, which is usually easier to collect at that time than it is during the evaluation stage as the latter can take place several months after the project is complete. This results in a more rigorous evaluation and guarantees that specific research topics important to the PM are covered. Ideally, an evaluation plan is designed for each program at the same time as the program is developed, which is not the case with the ENSC program portfolio. Therefore, Econoler has the following recommendation:

**Table 11: General Recommendation on Evaluation**

| No.     | Recommendations                                                                                                                                                                                                                                                                                                                                               |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OV-R11. | <b>Develop an evaluation plan in parallel with program design and development:</b> Econoler strongly recommends that for each new program an evaluation plan be prepared in parallel with program design and development. The program evaluation plan should present the evaluation efforts and detail the activities to be undertaken during the evaluation. |

The content of the evaluation plan can be tailored to the specifics of a given program. However, a certain amount of basic information is typically included in evaluation plans. The table below presents such information.

**Table 12: Information Typically Contained in Evaluation Plans**

| <b>Section</b>                                        | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description of the program and its marketing strategy | Brief description of the program and its marketing strategy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Program partners and their roles                      | Briefly identify partners and their roles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Evaluation window                                     | Evaluation period of the program (e.g., year 2011)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Program objectives (targets)                          | Objectives in terms of savings as well as predicted number of participants or units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Objectives monitoring (tracked savings)               | Data from the program tracking system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Objectives realization rate (%)                       | Ratio between targets and tracked savings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Business case                                         | Details on expected gross and net savings calculations: <ul style="list-style-type: none"> <li>&gt; Baseline energy efficiency level</li> <li>&gt; Energy efficiency level targeted by the program</li> <li>&gt; Annual hours of operation</li> <li>&gt; Gross savings (or unitary savings value per product or measure)</li> <li>&gt; Technical distortion effects (-%) such as interactive effects factors</li> <li>&gt; Free-ridership (-%)</li> <li>&gt; Internal spillover (+%)</li> <li>&gt; External spillover or market effects (+%)</li> <li>&gt; Net savings</li> <li>&gt; Other parameters</li> </ul> |
| Types of evaluations                                  | Type of evaluations needed for the program: <ul style="list-style-type: none"> <li>&gt; Process</li> <li>&gt; Market</li> <li>&gt; Energy impact</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Researchable themes and expected methodology

Content or subjects of research to be included in the evaluation (awareness, satisfaction, suggestion of improvements, gross savings, free-ridership, spillover) as well as corresponding methodologies (interviews, surveys, on-site visits, metering, billing analyses)

Sample size and duration of data collection activity in minutes

Precision level required for the evaluation

Precision level for impact evaluation and market evaluation

Data needed for the impact evaluation

Description of available data in database and identification of data to be collected

Work schedule

Time table to execute evaluation study

Documents available for consultation by the Evaluator

- > Program theory
- > Logic model
- > Marketing plans
- > Participation process flowchart
- > Past evaluation(s)
- > Others

## **4 INDIVIDUAL PROGRAM PERFORMANCE**

This section provides a summary of the key findings and recommendations for each of the programs. Note that the numbering of the recommendations corresponds to the numbering presented in the individual reports.

### **4.1 RESIDENTIAL**

#### **4.1.1 Appliance Retirement Program**

The 2011 evaluation of the ARet program demonstrated that the program is well designed and revealed a significant level of participation considering that it was still a fairly new program. The program achieved the retirement of 8,211 units for the year 2011. The evaluation revealed that the ARet program had generated net energy savings of 5.032 GWh and demand savings of 0.802 MW at the generator in 2011. To calculate the net savings of the ARet program in 2011, Econoler reviewed the gross savings estimated by ENSC, using results from a metering study conducted at the recycling facility and from other studies for similar programs. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey.

The process evaluation revealed that the main source of awareness of the ARet program came from advertising in the newspaper, on the radio or on TV. These results highlighted the positive impact of the marketing efforts on customer awareness as well as on the high number of participants. However, participants still believed that improvements were possible. Indeed, when asked about recommendations to improve the program, participants frequently mentioned better advertising. The DA agreed, expressing a lower satisfaction level towards the outreach and marketing activities. The DA mentioned the difficulties of working in collaboration with the third party marketing agency as it had no previous program expertise and little understanding of how program results were tied to advertising and marketing. According to the DA, this created a barrier to implementing an effective and engaging marketing campaign.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 13: Recommendations for the Appliance Retirement Program**

| No.             | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ARet-R1.</b> | <p><b>Strengthen the marketing strategy:</b> The 2011 evaluation results highlight the importance of marketing and advertising in the promotion and awareness of the ARet program. Indeed, most participants have read or heard about the program in newspapers, on the radio or on TV. The high number of participants is also a strong indicator of the impact of marketing on program awareness. However, both the DA and the participants have shared their desire to improve program marketing and advertising. The present recommendation stresses the necessity to continue improving the marketing strategy to fulfill both partner and participant requests for better and more effective marketing. Moreover, marketing and advertising should be oriented towards the main program barrier identified, which is the reluctance to dispose of an appliance that still works.</p> |
| <b>ARet-R2.</b> | <p><b>Ensure that all information necessary for evaluation purposes is collected in the tracking sheet:</b> The PM together with the evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. For instance, the year of manufacture and the size in cubic feet of the old refrigerators and freezers retired were very useful to the Evaluator in order to estimate the average energy consumption of these appliances. For dehumidifiers and room air conditioners, such information was not available. It would be useful to have at least the capacity, in litres per day, for dehumidifiers and in Btu per hour for room air conditioners, which is a key determinant of energy consumption for those appliances.</p>                                              |
| <b>ARet-R3.</b> | <p><b>Pursue the metering of refrigerators and freezers at the recycling facility:</b> For refrigerators and freezers, the unitary savings calculation was based on metering data, which allowed taking into account the actual condition of the old appliances retired and their degradation over time. For the next evaluation, Econoler recommends pursuing this approach by metering the energy consumption of a representative sample of refrigerators and freezers retired during the year. Thus, it is no longer necessary to ask the recycler to collect the theoretical energy consumptions of the appliances in the tracking sheet but it remains important to monitor the size and the age of the appliances retired, which are two parameters used in the unitary savings calculation.</p>                                                                                     |

**ARet-R4**

**Conduct on-site metering for dehumidifiers and room air conditioners:**

The metering conducted at the recycling facility included the consumption measurement of 29 dehumidifiers and 12 room air conditioners retired through the program. However, the results obtained from this metering study could not be used in this evaluation. Econoler suspected that the environment conditions at the recycling facility were not representative of those found in homes when these appliances are in function, typically during the summer. Therefore, Econoler recommends considering on-site metering to be carried out next summer in homes that operate old dehumidifiers and room air conditioners and that have manifested their desire to retire their old appliances.

#### **4.1.2 Appliance Replacement Program**

The ARep program achieved the replacement of 531 refrigerators, 62 freezers and 107 mini-fridges for the year 2011. The evaluation revealed that the program had generated net energy savings of 0.548 GWh and demand savings of 0.065 MW at the generator in 2011. To calculate the net savings of the ARep program in 2011, Econoler reviewed the unitary savings estimates, using the metering data from the ARet program and the theoretical energy consumption of the new models installed, based on the ENERGY STAR-qualified product list.

As for the process evaluation of the ARep program, the retailer partner contacted during an in-depth interview expressed a very high level of satisfaction with the overall program as well as with ENSC's team and other program partners (transport and recycling contractors). However, the retailer identified an improvement that would have a positive impact on program design and implementation. The retailer suggested offering participants financing. Purchasing of large quantities was not possible because payment was required prior to delivery.

Even though the program has been discontinued for 2012, the Evaluator has the following recommendations that aim at optimizing specific aspects of the program in the event that a similar initiative is launched in the future:

**Table 14: Recommendations for the Appliance Replacement Program**

| <b>No.</b>      | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ARep-R1.</b> | <b>Consider offering financing:</b> The financing barrier to purchasing large quantities of appliances was raised through the process evaluation. It is important to have knowledge of any program barrier, such as this one, to consider the necessary actions to mitigate them as much as possible and ensure optimal success in program implementation. In that sense, ENSC could improve the availability of upfront capital from landlords. |



**ARep-R2. Include a field in the tracking sheet to validate the ENERGY STAR qualification:** The tracking sheet does not include a field to validate the ENERGY STAR criterion required for the new appliances installed through the program. Econoler recommends the addition of such a field in the tracking sheet. This way, the DA will have to ensure that the installed refrigerators meet ENERGY STAR qualifications by referring to the ENERGY STAR- qualified product list. In fact, Econoler found that a few new appliances entered in the tracking sheet were not ENERGY STAR qualified. For one particular case, the nonconformity was due to a misunderstanding from the participant, because of a language barrier, and ENSC had already addressed this issue by not claiming the full savings value for these appliances. Econoler agreed with this solution but still believed that the addition of a field to validate the ENERGY STAR criterion and to identify the energy consumption of the appliance would ensure that savings are calculated correctly.

#### **4.1.3 Retail Markdown Program**

The 2011 evaluation of the RMP demonstrated that the program used the right approach from a market transformation and resource acquisition perspective. There was a higher incidence of program participants in 2011 (37%) than in 2010 (31%) and 2009 (17%).

The evaluation revealed that the RMP achieved net energy savings of 13.802 GWh and demand savings of 1.388 MW at the generator in 2011. These results include savings from the products sold during two markdown periods, from the specialty CFLs given away during in-store weekend events and from the products sold through the Air Miles pilot project. To calculate the gross and net savings, Econoler took into consideration the replacement ratio and in-service rate of CFLs, the interactive effects for lighting products as well as free-ridership and spillover for three important products: CFLs, refrigerators and clothes washers.

Survey results showed that program awareness had dropped among participants and non-participants in 2011 compared to 2010. Indeed, fewer participants and non-participants recalled seeing in-store promotions during the two markdown periods. The same observation was made regarding the discount offering. The relatively low level of promotion and discount awareness is consistent with information collected during the in-store visits. The mystery shoppers noticed that the promotional display was sometimes disheveled and gave an impression of a lack of organization. Consequently, the clients who did not know about the program, and even the ones who did, had difficulty identifying discounted products. Moreover, the program partners and retailers contacted during in-depth interviews identified the marketing material as the main program barrier.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 15: Recommendations for the Retail Markdown Program**

| No.     | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RMP-R1. | <p><b>Review marketing material and in-store display to increase program awareness:</b> Survey results, in-store visits and partner interviews all indicate that program marketing and advertising is the one aspect that leaves the most room for improvement. Considering all data collected, it seems that the problem resides in both the design and the implementation of the program marketing material. Improvements need to be made in order for program awareness to increase among participants and non-participants. To that effect, the present recommendation is divided into two components. The first part of the recommendation aims at improving the appearance of the marketing material by keeping it informative while making it more appealing to consumers in order to really capture their attention. The second part of the recommendation specifically targets collaboration with the retailers. A lack of organization in the presentation of the marketing material was observed as part of many in-store visits. To resolve that issue, Econoler recommends providing retailers with more help with the installation of the marketing material. As brought up by the retailers, ENSC's sales representatives could visit the stores before the markdown periods to assist the staff in the preparation to launch the program by making sure that all marketing tools are well installed. This approach would guarantee that the marketing and advertising are optimal. It would inform customers of the existence of the program and guide them towards eligible products, which in turn should reduce the free-ridership level.</p> |
| RMP-R2. | <p><b>Consider conducting exit surveys:</b> The challenge of the Evaluator for such a program lies in the fact that participants are unknown and it is necessary to survey a large number of consumers to find an adequate sample of participants. Even then, a portion of these participants may be unaware or have forgotten that there was a discount in their purchase, making the mass survey an imprecise tool for monitoring the market. An exit survey, which usually consists of in-store intercept interviews with people who have just completed their purchases, could solve part of this problem. Interviewing participants right after their purchase could result in a lower free-ridership level since participants will have better recollection of the discount offered and the level of influence it had on their purchase. Moreover, other relevant information for the impact evaluation could be assessed during these exit surveys. For instance, an exit survey targeting thermostat buyers would allow collecting information on the housing type and the main source of energy they use.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

- RMP-R3. Increase the number of retailer interviews planned for the evaluation:**  
During retailer interviews, Econoler noticed that the program had not only influenced the participants with the discount but had also influenced other aspects of the market that consumers did not necessarily perceive and attribute to the program. Indeed, retailers declared that the program had influenced their in-store offer, the awareness of salesperson and product availability, all in favor of more energy-efficient products. By increasing the number of retailer interviews, it would be possible to capture and quantify more precisely all these indirect influences on the market. Moreover, it could allow estimating spillover through market effects for other products that were not targeted during this evaluation.

#### **4.1.4 LED Holiday Light Exchange Program**

Since the 2007 Integrated Resource Plan (IRP), 46,399 LED holiday light sets have been handed out through the LHLE program and no evaluation has been conducted since the program started its activities. Therefore, the evaluation conducted this year for this program aimed to evaluate the electricity savings generated by the program since 2007.

The 2007-2011 evaluation of the program demonstrated good results. Since 2007, the program has generated net energy savings of 1.447 GWh and demand savings of 3.618 MW. To calculate the net savings of the program, Econoler reviewed the parameters used by ENSC to estimate program gross savings and took into consideration interactive effects for LED holiday lights. The net evaluated savings fell short of the tracked savings by 20.8 percent for energy savings and by 60.4 percent for demand savings. The addition of an interactive effects factor and the adjustment of the diversity and line loss factors explain this drop in savings.

Because of the short period targeted by the program and the relative level of savings it generated, ENSC has not planned any process evaluation activities for this evaluation. Therefore, the Evaluator did not have any particular recommendations for this program.

#### **4.1.5 Low Income Renter Program**

The 2011 evaluation of the LIR program demonstrated that the program has a good potential for success considering that it was a pilot and that it targeted a market that had not been explored before. The program totalled 4,920 participants for the year 2011. Using the revised unitary savings values, the installation rates and the interactive effects factors, the evaluation revealed that the LIR program had generated 4.756 GWh and demand savings of 1.066 MW at the generator.

The program partners contacted during the in-depth interviews identified the main program barrier to be the limited number of participants as a result of the few eligible leads provided by housing

authorities. Secondly, they reported the most common program concern as being related to CFLs (too dim, presence of mercury, etc.). During the telephone survey, the participants were also asked to share their concerns about the program. Only one respondent out of 70 had concerns about the presence of mercury in CFLs. Therefore, according to participants' responses, health risks associated with the products installed through the program did not constitute a significant barrier. However, the program partners' declaration should not be ignored as this barrier could become relevant in the future. Considering that the LIR program is new, barriers are bound to change along the way.

Econoler found that the program is well on its way to becoming successful. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 16: Recommendations for the Low Income Renter Program**

| <b>No.</b>     | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LIR-R1.</b> | <b>Monitor program barriers and participant concerns:</b> To make sure to go forward with the program and in the right direction, program barriers and participant concerns will have to be watched closely. They should be monitored frequently to adjust program components or the marketing strategy and ensure that they are addressed properly. For example, the presence of mercury in CFLs was brought up as a program barrier by partners, but was not confirmed by participants. However, if the perceived health risk becomes a more important barrier among participants, ENSC could develop a brochure to better inform the participants about the technologies installed.                                                                                                                                                                                                                                     |
| <b>LIR-R2.</b> | <b>Improve measure sustainability:</b> The on-site visits revealed that some of the products installed through the program were often removed after installation or used in a way that did not allow for the achievement of energy savings. To maintain the sustainability of the products installed, Econoler recommends giving participants more information on the products promoted through the program. More specifically, more information on the benefits of LED nightlights and faucet aerators as well as on how to use power bars with integrated timer should be given to participants. This strategy could help participants use the products correctly and prevent them from removing the products as they would be aware of all product advantages. It is to be noted that, for the most installed product (CFLs), only 1.6 percent were removed after installation, showing a high level of sustainability. |

**LIR-R3****Increase the number of on-site visits to validate product installation:**

During the 15 on-site visits conducted for this evaluation, Econoler noted that a removal phenomenon existed for CFLs, and more significantly for LED nightlights and faucet aerators. However, the number of on-site visits was not sufficient to establish an installation rate that could be applied to all the products installed through the program. For the next evaluation, Econoler recommends increasing the number of on-site visits in order to have a reasonable precision level that would allow for the establishment of installation rates for CFLs, LED nightlights and faucet aerators.

**LIR-R4.****Collect additional information to allow for a more precise evaluation of savings:**

The PM, together with the evaluator, should determine what fields are necessary for administration and evaluation purposes. There are two fields in the tracking sheet that are not filled systematically: the percentage of electric space heating and the hot water heating type. These two fields would be useful for the impact evaluation, more specifically for estimating interactive effects, and should be added to the data gathering protocol. In addition, information on the use of air conditioning, which would allow a more precise estimation of interactive effects factors, should also be added to the data gathering protocol. In the case of lighting products, the power of old lamps replaced is another element that could be relevant for validating the baseline case and for ensuring that the new lamps installed actually replaced less efficient lamps. At first, Econoler had planned to validate such information during on-site visits but participants did not know the exact wattage of the old lamps replaced in their home.

**4.1.6 Multi-Unit Residential Renter Program**

The program, together with its associated pilot projects, achieved direct installation of products in 853 households for the year 2011. Using the revised unitary savings values, the installation rates and the interactive effects factors, the evaluation revealed that the MURR program had generated net energy savings of 0.654 GWh and demand savings of 0.104 MW at the generator.

The survey results demonstrated the accuracy of the information found in the tracking sheet. Very few discrepancies were observed between survey results and the tracking sheet as respondents were asked to confirm the products that had been installed through the program. Moreover, no removal phenomenon for a particular product was identified during the survey. This result was confirmed by the installation rate of 100 percent observed for CFLs during on-site visits.

Therefore, it is not surprising to learn that satisfaction towards the program was very high among participants. Indeed, most participants expressed their satisfaction with the overall program. In fact, no participant mentioned being either dissatisfied or very dissatisfied with the overall program as well as with the following aspects of the program: the time required to complete the work, the energy evaluation of their apartment and the products installed. Participants were not the only ones satisfied with the MURR program, the program partners interviewed also shared positive comments.

Even though ENSC has decided that the MURR pilot program will be reconfigured in 2012, mentions of possible improvements remain relevant for the future. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 17: Recommendations for the Multi-Unit Residential Renter Program**

| <b>No.</b>      | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MURR-R1.</b> | <b>Review marketing material used for lobby events:</b> The program partners have mentioned that the information related to time commitment shown on the marketing posters used to promote the lobby events was misleading. This resulted in tenants not showing up to the events. If lobby events are part of a reconfigured program, the marketing posters should accurately describe the time commitment and involvement required from the tenants. This would prevent losing tenants who would have showed up to the events but did not because the information was confusing.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>MURR-R2.</b> | <b>Improve measure sustainability:</b> The on-site visits revealed that the products installed through the program were rarely removed after installation. This observation proves the high level of participant satisfaction with the products installed and reflects the benefits of informing participants, during special events or walk-through audits, about the advantages of the products installed. However, the on-site visits also revealed that power bars with integrated timer are not used in a way that allows for energy savings, meaning that participants do not activate the timer that controls the power bar. To maintain the sustainability of the savings generated by the installation of such products, Econoler recommends giving participants more information on the benefits and on the use of power bars with integrated timer. This strategy could help participants use the product correctly as they would be aware of all its advantages. |

- MURR-R3. Continue to offer programs targeting the multi-unit renter market:** Multi-unit renters are often less interested in energy efficiency because they are less likely to install energy-efficient products in a home they do not own and where, in some cases, they are not responsible for paying the electricity bills. Indeed, the low level of free-ridership measured through the participant survey reveals that most participants would not have installed any energy-efficient products in the absence of the program. This result shows the need for increasing awareness for energy efficiency in this market.

#### **4.1.7 Efficient Products – Direct Install Program**

The 2011 evaluation of the EP-DI program demonstrated that the program is well designed for the market it targets and has evolved a great deal since its beginning in 2008. The EP-DI program totalled 4,595 projects for the year 2011. Additionally, 254 installations were conducted under the Retail LED Direct Install pilot project. The program generated net savings of 25.760 GWh and demand savings of 2.63 MW at the generator. To calculate the net savings of the EP-DI program in 2011, Econoler reviewed the gross savings estimated by ENSC using a review of unitary savings results from the on-site visits and included interactive effects for lighting products and hot water tank wraps. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey.

The main source of awareness of the EP-DI program came from the actions of program staff or representatives in general. More specifically, most participants learned about the program during an in-person visit or a telephone call from a program representative. Very few participants identified learning about the program through marketing material. These results highlighted the use of the call centre and one-on-one encounters as important marketing tools to contact eligible businesses and promote the program. Participants and program partners mentioned better marketing and advertising as suggestions to improve the program.

Econoler found that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 18: Recommendations for the Efficient Products – Direct Install Program**

| No.              | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EP-DI-R1.</b> | <p><b>Improve the tracking sheet to allow for a better validation of savings:</b> Several fields in the tracking sheet are not required for program administration. Those fields are present even though they are not filled and should be removed for clarity purposes. Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. The analysis of the 2011 tracking sheet revealed that the rate code values for the facility where the products were installed were missing or not available for 20 percent of the records. Finally, usage group labelling could be improved to limit the usage of “Other” to identify the facility type. Knowing the type of facility where the measure is implemented is useful for evaluation purposes.</p>                                                                    |
| <b>EP-DI-R2.</b> | <p><b>Include more material to the marketing strategies:</b> The 2011 evaluation results highlight the main use of the delivery agent’s call centre and one-on-one encounters as marketing tools to contact eligible businesses and promote the EP-DI program. Indeed, most participants have learned about the program from the actions of program staff or representatives. Very few participants have learned about the program through marketing material. However, both program partners and participants have shared their desire to improve program marketing and advertising. The present recommendation points out the necessity to explore other marketing strategies that include marketing material addressing both partner and participant requests for better, more effective marketing as well as for further information on the program in general.</p> |



- EP-DI-R3. Require additional information during survey campaigns with commercial and industrial (C&I) customers as well as from participants and increase the number of on-site visits to better calculate savings:** Additional information would be necessary on some measures in order to estimate savings that are closer to reality. For hot water tank wrap installations, the volume of the tank insulated should be collected. For occupancy sensors, information on the total wattage of lamps controlled by occupancy sensors and the hours of operation should be collected. In order to be able to use the savings calculation approach presented by the Ontario Power Authority for commercial thermostats, additional information should be collected on the rooms where programmable thermostats are installed and on the settings of such thermostats. For dishwasher spray valves, information on the time of use should be collected. For all participants who had lighting products, occupancy sensors or hot water tank wraps installed, information on the heating source and the use of air conditioning should be collected to better estimate the interactive effects factors. This information should also be collected during C&I survey campaigns. The number of on-site visits conducted for the evaluation should be increased for categories with a large number of projects like the CFL category. This would allow for the collection of reliable information for these categories and the establishment of adjustment values that could be used to correct savings.

#### **4.1.8 EnerGuide for Existing Houses Program**

The 2011 evaluation of the EEH program demonstrated that it is a good energy efficiency initiative that included all the necessary ingredients to implement measures tailored to the conditions of each house. The program totalled 1,494 participants for the year 2011, which constituted a slight diminution compared to the previous year (1,516 participants). Nevertheless, it still represents a much higher number in comparison to the year 2009 (520). The evaluation revealed that the EEH program (including the pilot project) had generated net energy savings of 5.046 GWh and demand savings of 1.609 MW in 2011. To calculate the gross savings of the EEH program in 2011, Econoler reviewed the gross savings estimated by ENSC using three key features. The latter were namely the savings per EnerGuide point increase, the savings generated in relation with the implementation of prescriptive measures as well as savings due to the installation of energy-efficient products in households in the framework of two Direct Install pilot projects.

The 2011 process evaluation revealed that in spite of their satisfaction, program partners have shown concern regarding the future of the program and have brought up program continuation as the most important program barrier, considering the uncertainty of federal government involvement. Program partners claimed that marketing efforts had been inconsistent throughout the changes in federal support. Thus, they highlighted the need to improve the marketing and outreach activities in that

manner. The program partners also received complaints from participants on the lack of information available about qualifying measures.

Econoler finds that the program includes good practices and has reached a satisfactory level of energy savings. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 19: Recommendations for the EnerGuide for Existing Houses Program**

| No.     | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EEH-R1. | <b>Create a list of pre-approved contractors:</b> During the in-depth interviews, some of the program partners mentioned the contractors' deficient understanding of energy efficiency programs. The lack of experienced contractors to implement the measures is an important barrier to the program. Training contractors and establishing a list of pre-approved contractors should be part of the program components to reduce complaints and achieve program savings as closely as possible.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| EEH-R2. | <b>Maintain marketing efforts to show program continuation:</b> The program partners have shown concern regarding the future of the program and have brought up program continuation as the most important program barrier, considering the uncertainty of federal government involvement. The present recommendation points out the necessity to be proactive as far as marketing efforts are concerned and to maintain these efforts in order to reassure program partners as well as Nova Scotians that the Province is serious about the program, regardless of federal support.                                                                                                                                                                                                                                                                                                                                          |
| EEH-R3. | <b>Inform participants about expected customer savings:</b> Since the main reason cited by participants for not having implemented some measures recommended by the EEH program is that measures are too expensive, the Evaluator suggests informing the participants about the expected savings of their project, in terms of energy and money. This could be included in the pre-retrofit report with a view to reducing the perceived cost barrier. This improvement would also fulfill the participants' request to have more information on the measures recommended as well as their main motivation for participating in the EEH program, savings on energy costs and bills. ENSC could also analyze the potential for developing an on-bill financing scheme for residential customers. This could help overcome the financial barrier related to the implementation of certain expensive energy efficiency measures. |

**EEH-R4.**

**Collect the building energy consumption data for each house:** The Evaluator recommends calculating the energy savings of each participant using the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the retrofitted house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section **Error! Reference source not found.** for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.

**EEH-R5.**

**Conduct a more thorough billing analysis to evaluate the overestimation of energy consumption by HOT2000 with better precision:** The billing calibration developed in the 2011 evaluation revealed that HOT2000 tends to overestimate the house energy consumption. In the future, the Evaluator proposes developing a more comprehensive billing analysis to calculate an adjustment factor with a higher accuracy level. Using all participants from 2009, 2010 and 2011, a billing analysis could compare one full year of pre- and post-implementation energy consumption data with a view to establishing an adjustment ratio by comparing the HOT2000 expected savings to the actual reduction in participants' energy bills.

**EEH-R6.**

**Revise HOT2000 models on a random basis:** The Evaluator or the PM should review a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The number of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of EnerGuide rating by more than 40 points.

#### **4.1.9 Fuel Substitution Pilot**

The 2011 evaluation of the Fuel Substitution Pilot demonstrated that the program has great potential for success considering that it was a pilot. The program totalled 296 participants for the year 2011. In terms of net savings, the program generated energy savings of 1.57 GWh and demand savings of 0.78 MW at the generator. To calculate the net savings of the Fuel Substitution Pilot in 2011, Econoler reviewed the gross savings estimated by ENSC. Moreover, Econoler took into consideration the free-ridership measured as part of the participant survey.

Survey results showed that half of the participants had learned about the Fuel Substitution Pilot at the store where they purchased their new equipment. This finding explains the free-ridership level of 42 percent calculated for the pilot. It also shows that the program could benefit from greater promotion and wider distribution through potential partnerships with retailers and other entities. In addition to working with stores, the upstream advertising campaign should target homeowners who are not at the stage of shopping. This aims to influence decision making of homeowners who have not already decided to replace or substitute their electric space or domestic water heating energy source.

Even though the Fuel Substitution Pilot is being reconfigured to promote green heating systems in 2012, recommendations remain relevant as the new program will benefit from the lessons learned from the Fuel Substitution Pilot. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 20: Recommendations for the Fuel Substitution Pilot**

| <b>No.</b>      | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fuel-R1.</b> | <b>Consider making partnerships for program expansion:</b> At this point, the program is a pilot and does not include delivery agents (DAs) or contractors for instance. For such a pilot to become a program, a DA would be useful along with competent subcontractors in order to have better control over program implementation. The DA could be involved once the program generates enough participants.                                                                                                                                                                                                                                                                                                                                  |
| <b>Fuel-R2.</b> | <b>Increase awareness through upstream advertising and collaboration with stores:</b> Survey results showed that half of the 2011 participants had learned about the pilot at the store where they had purchased their equipment. For this kind of program, collaborating with commercial partners such as stores would represent a way to increase promotion as well as act as a lever to strengthen awareness. However, upstream advertising should also be done in order to influence decision making among homeowners who have not already decided to replace or substitute their equipment, which could reduce the level of free-ridership observed.                                                                                      |
| <b>Fuel-R3.</b> | <b>Improve the tracking sheet with additional information:</b> First, project status, whether completed or in progress, should be clearly defined to facilitate the selection of projects for which savings can be claimed. Second, the tracking sheet does not include any information on the capacity of the old and new systems. Having this information on hand could help justify the savings allocated by the PM to the new measure implemented, especially in situations where values different from the prescriptive value are used. Finally, collecting information on the heating load provided by a secondary heating source would give a basis for savings adjustment when high usage of a secondary heating source is identified. |

- Fuel-R4. Conduct a billing analysis in order to evaluate energy consumption for heating:** A billing analysis would provide a more precise evaluation of the energy consumption for heating as well as a better evaluation of energy savings. The household average heating consumption value is the main assumption for calculating the energy savings and should be evaluated specifically for participants using a billing analysis.
- Fuel-R5. Continue targeting participants who could install natural gas systems:** The survey results showed that the pilot had had a great influence in the decision to convert a heating system from electricity to natural gas, compared to other conversions. Increasing the number of participants installing natural gas systems could potentially reduce the free-ridership level, resulting in a higher NTGR for the program. Moreover, conversions to natural gas heating systems present higher unitary savings as these systems seldom require the use of a secondary heating system.

#### **4.1.10 Low Income Program**

The 2011 evaluation of the Low Income program demonstrated that the program has good potential for success and that it is essential to ENSC's program portfolio considering that it targets customers who do not have the financial resources to implement energy efficiency measures on their own. The program totalled 5,103 participants for the year 2011, which represents a significant increase in comparison to 2010 (645 participants). Using the adjusted energy savings per EnerGuide point, the revised unitary savings values for prescriptive measures, the interactive effects factors and the NTGR, the evaluation revealed that the Low Income program had generated net energy savings of 7.636 GWh and demand savings of 1.632 MW at the generator in 2011.

All program partners interviewed reported the confusion among consumers created by the name changes undergone by the program since its launch. According to program partners, participants mixed up the Residential Energy Affordability Program (REAP) and the Low Income program. Since marketing research conducted by NSPI indicated that the actual program name (Low Income) was best suited for the program, efforts would have to be put forth to eliminate all confusion in the market.

Satisfaction towards the program is very high among participants. Moreover, all participants mentioned that they would recommend the program to a friend or a family member. Program partners also reported being very satisfied with the overall program as well as with their relationship with ENSC's team.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 21: Recommendations for the Low Income Program**

| <b>No.</b>    | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LI-R1.</b> | <p><b>Assess the installation rate of certain prescriptive measures:</b> In 2011, the savings related to the increase of EnerGuide points accounted for only 13 percent of total program energy savings, the remaining proportion being due to the prescriptive measures or the energy efficiency products directly installed on site (including those installed through the First Nation pilot project). With this in mind, Econoler believes that on-site visits aiming at validating the installation rate of the Direct Install products should be performed under future project evaluations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>LI-R2.</b> | <p><b>Review HOT2000 models on a random basis:</b> The Evaluator or the PM should review a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>LI-R3.</b> | <p><b>Ensure the final audits are completed after the implementation of measures:</b> In the 2011 final tracking sheet, the vast majority of projects had not yet had their final audit completed. ENSC explained that this situation was exceptional. Indeed, the fact that the Federal Government came back into EnerGuide and the Team Buy Initiatives organized for the EnerGuide for Existing Houses (EEH) program caused an increase in the number of participants in 2011 for both Low Income and EEH programs. As a result, the auditors became very busy in performing initial audits and important delays occurred for the completion of final audits. For these projects, ENSC used the projected E EnerGuide rating and a realization rate of 75 percent to calculate the savings related to the increase of EnerGuide point, which should normally only be used as a temporary estimate. ENSC should ensure that the DAs have sufficient staff and a protocol in place that would allow ensuring that all final audits are completed within a short period after the measures are implemented.</p> |

#### 4.1.11 Performance Plus Program

The 2011 evaluation of the Performance Plus program demonstrated that the program is well designed. The program totalled 701 participants for the year 2011, which represents a significant increase compared to the previous year (260). The evaluation revealed that the program had generated net energy savings of 2.454 GWh and demand savings of 0.861 MW in 2011. To calculate the net savings, Econoler reviewed the gross savings estimated by ENSC using the adjusted savings per EnerGuide point increase and the unitary savings values of the prescriptive measures. The Evaluator also took into consideration the free-ridership and internal spillover levels measured through the participant survey as well as the market effects obtained through the builder in-depth interviews.

Survey results demonstrated the importance of builders as program partners. Indeed, a significant share of homeowner participants mentioned that the decision to participate in the program had been made by the builder. Moreover, surveyed participants stated that home builders and contractors had been an important source of program awareness, which was confirmed in the free-ridership assessment. This is good news considering that the participating builders contacted during the in-depth interviews were all very satisfied and content with the program and wished for it to continue.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 22: Recommendations for the Performance Plus Program**

| No.           | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PP-R1.</b> | <p><b>Increase the number of in-depth interviews with home builders:</b> When conducting in-depth interviews with builders, the Evaluator noted that one participating builder mentioned having built houses that would have reached an EnerGuide rating of 83, but without participating in the program. One non-participating builder also mentioned having implemented energy efficiency measures that were promoted by the program. However, the low sample of interviewed builders (10) prevented the Evaluator from clearly determining whether this finding would translate into more substantial market effects than those calculated in relation with the builder interview results. Consequently, Econoler recommends increasing the number of interviews with participating builders in future evaluations to have a better chance of capturing potentially more significant market effects.</p> |

**PP-R2.**

**Improve program communication:** The main recommendations expressed by homeowner participants were related to communication improvements. More specifically, the surveyed participants suggested improving the program by offering more information on the measures recommended and increasing program advertising. Moreover, the fact that some respondents stated that ENSC should add measures to the program that were already covered by the latter, shows that improving program communication is necessary.

**PP-R3.**

**Include the building energy consumption data of HOT2000 simulations in the tracking sheet:** The Evaluator recommends calculating the energy savings of each participant through the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the project savings. Then, this savings figure may have to be adjusted with the calibration of the HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.

**PP-R4.**

**Revise HOT2000 models on a random basis:** The Evaluator or the PM should review a small percentage of HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should correspond at least to one project per energy advisor.

**PP-R5.**

**Add a percentage of heating delivered by electricity:** For the year 2011, ENSC claimed 100 percent of EnerGuide point increase savings for houses whose main heating source was electricity even if there was a non-electric backup heating system installed. This assumption increases the uncertainty in gross impact calculations. Econoler believes that ENSC's tracking sheet should include a percentage (ranging from 0 to 100%) to take into account houses that are not fully heated with electricity year-round. This information can be collected from HOT2000 simulation results. The program delivery agents should also be able to verify this information on site during their audit with program participants.



## **4.2 COMMERCIAL & INDUSTRIAL**

### **4.2.1 Business Energy Rebates Program**

The 2011 evaluation of the BER program demonstrated that the program is well designed and has a good potential for success. The program totalled 106 participants for the year 2011, which is a substantial increase compared to the previous year (13 participants) when the program started. The evaluation revealed that the BER program had generated net energy savings of 7.010 GWh and demand savings of 1.420 MW at the generator in 2011 (compared to 0.503 GWh and 0.073 MW in 2010). To calculate the net savings of the BER program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from the on-site visits and included interactive effects for lighting products. Moreover, Econoler took into consideration the free-ridership and internal spillover measured as part of the participant survey.

The ENSC website and the literature contributed significantly to program awareness in 2011, as 25 percent of participants learned about the program through those two components. Econoler found the ENSC website to be an excellent communication tool for the program. However, participants mentioned recommendations to improve the program that mainly relied on communication improvements: more information or information sessions, better marketing as well as more contact between customers and program staff. Furthermore, in order to fulfill the most important motivational element for participating in the BER program and for installing energy-efficient equipment, program activities and documentation should continue to focus on energy savings and cost reductions.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 23: Recommendations for the Business Energy Rebates Program**

| <b>No.</b>     | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BER-R1.</b> | <p><b>Improve the tracking sheet to allow for a better validation of savings:</b> Currently, all the calculation values in the tracking sheet are contained in one cell, not allowing for a systematic validation of the savings for each measure. Breaking down the values used for savings calculations would allow the Evaluator to validate the savings calculations for each measure in the database instead of using adjustment ratios. Furthermore, most categories of measures include several sub-categories. The savings calculations approach is often very different from one sub-category to the other. Including the sub-category of the measure in the tracking sheet would allow selecting the most appropriate approach and baseline values to calculate savings during the evaluation process.</p> |

- BER-R2.** **Inform participants about expected customer savings:** Once the final rebate is disbursed to clients, Econoler recommends informing them about the approximate savings to be expected from the project, in terms of energy and money. This would be an easy way to communicate energy savings and cost reductions, which constitutes the most important motivation for participating in the BER program and for installing energy-efficient equipment.
- BER-R3.** **Increase program promotion:** The fact that the ENSC website, the literature, the staff and the presentation were mentioned as source of program awareness is a positive result showing that ENSC actions contribute to program knowledge. However, evaluation results indicate that there could be additional effort in program promotion and communication. This could be assessed by having more contact people, giving information sessions such as lunch and learns as well as by advertising through other websites and organizations.
- BER-R4.** **Require additional information from participants to better calculate savings:** Additional information would be necessary for some measures in order to estimate savings more accurately. For HVAC equipment, the use of full load hours for calculating savings should be validated with participants. For refrigeration units, temperature and hours of usage should be collected. For occupancy sensors, information on the usage period should be collected to calculate the impact on peak demand. Finally, for all lighting participants, information on the heating source and the use of air conditioning should be collected during the surveys with C&I customers to better estimate the interactive effects.
- BER-R5.** **Increase the number of on-site visits to include an acceptable quantity of projects for each category of equipment installed through the program:** Several on-site visits are required to properly assess adjustments to energy and demand savings for each category of equipment. For the current evaluation, since the population was limited at the time of site selection, a single on-site visit was conducted for some categories, not allowing for adjustment values to be established for all measures in these categories. For the next evaluation, it is necessary to make sure that all known categories of equipment are covered with sufficient on-site visits to validate savings for each category.

## 4.2.2 Smart Lighting Choices Program

The 2011 evaluation of the SLC program demonstrated that it is well designed and has a good potential for success. For the year 2011, the program totalled sales of 423,176 high-performance T8 (HPT8) lamps and 137,637 HPT8 ballasts, which was an increase compared to sales achieved during the previous year. Additionally, 1,732 products were purchased through the UBER sub-program. In terms of net energy savings, the program generated 7.77 GWh, which represented a significant increase in comparison to 2010 net savings (6.24 GWh). This includes savings for the UBER sub-program. To calculate the net savings of the SLC program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from the on-site visits and included interactive effects for lighting products. The Evaluator also used the free-ridership levels obtained through in-depth interviews with program distributors.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 24: Recommendations for the Smart Lighting Choices Program**

| No.     | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SLC-R1. | <p><b>Improve the quality of distributors' invoices and develop a tracking sheet that monitors program savings for the whole year:</b> Several formats are used in the invoices provided by distributors. These invoices do not feature the same type of information. Fields are also not filled in systematically in numerous instances. A template indicating the information required for program monitoring should be provided to all distributors and would facilitate the consolidation of the different invoices received. Moreover, ENSC should consider establishing a 100 percent approval threshold for the invoice fill rate and request that all distributors indicate the type of product sold for each purchase. This would facilitate savings calculations based on the invoices received. Lastly, the PM should develop a tracking sheet that allows monitoring savings for the whole year instead of completing individual monthly reports as is currently the case.</p> |
| SLC-R2. | <p><b>Collect additional information through telephone surveys conducted with commercial and industrial (C&amp;I) customers:</b> ENSC should investigate retrofit activities involving de-lamping during its telephone survey campaigns with C&amp;I customers. This will provide information on the use of de-lamping as well as on the proportion of customers who purchase high-performance T8 lamps as a result of de-lamping projects. Additionally, information on T8 to T8 replacements could be collected from these customers. Such replacements would reduce program energy savings. In order to better evaluate the interactive effects factors, information on the heating source and on the use of air conditioning should also be collected during the surveys with C&amp;I customers.</p>                                                                                                                                                                                   |

### 4.2.3 Custom Program

The 2011 evaluation of the C&IC and CINC programs demonstrated that these programs have a good potential for success. The two programs totalled 168 projects for the year 2011 (159 for the C&IC and 9 for the CINC), which was a substantial increase compared to the previous year (102 projects). Moreover, the evaluated energy savings and peak demand savings almost doubled. In terms of net energy savings, the C&IC and CINC programs generated respectively 30.32 GWh and 2.61 GWh in savings, totaling 32.93 GWh saved in 2011, which represented a considerable increase in comparison to 2010 net savings (total of 19.4 GWh). In terms of demand savings, the C&IC program generated 3.764 MW in 2011 (compared to 2.4055 MW in 2010).

In order for the number of participants to keep increasing and to ensure program continuity in the years to come, program awareness constitutes an important aspect of the program strategy. The evaluation revealed that the main source of awareness for the C&IC program was ENSC's marketing outreach and activities (ENSC staff, ENSC presentation or ENSC website). It should be noted, nevertheless, that almost half of the participants had participated in other NSPI or ENSC programs prior to participating in the C&IC program, which is an important source of awareness. Moreover, the addition in 2010 and 2011 of sales leads clearly contributed to the increase in the number of participants.

Econoler finds that the C&IC program works generally well and at a satisfactory level. The CINC program presents great potential for success and Econoler identified several opportunities for improving it. The Evaluator has the following recommendations that aim at optimizing specific aspects of each program:

**Table 25: Recommendations for the C&IC Program**

| No.                 | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C&amp;IC-R1.</b> | <b>Clearly define the M&amp;V requirements before signing the PDA:</b> The Evaluator noted that most of the projects do not have a dedicated M&V plan even though M&V was considered as complete and approved. The Evaluator recommends that all projects have an M&V plan outlined in the early stages of the project process. The M&V plans should be compliant with the International Performance Measurement and Verification Protocol (IPMVP). The Evaluator also recommends developing the M&V plan before signing the PDA. The PDA may even enclose a preliminary version of the project's M&V plan. In 2011, ENSC started developing a set of M&V plan templates (especially for simple lighting retrofit projects) which are compliant with the IPMVP. These templates should significantly help program participants develop their own M&V plan and is a first step toward standardizing the M&V activities performed under the C&IC program. |

- C&IC-R2. Envisage performing third-party M&V for a number of C&IC projects:** ENSC should consider performing third-party M&V on projects where the implementation firm is also the one conducting M&V under its project scope of work. Such implementation firms may perform M&V that is not compliant with the IPMVP or that includes measures which are not eligible for the C&IC program but are not simple to extract from the M&V results. In addition, giving the sole responsibility of M&V to the firm that also implements the project may be risky. To reduce this risk, the Evaluator recommends engaging third-party M&V for such projects. A minimum threshold of energy savings could also be defined to differentiate projects that would automatically require third-party M&V from those for which it would be optional. The Evaluator believes that third-party M&V could be done either by ENSC or by an independent consultant.

**Table 26: Recommendations for the CINC Program**

- | <b>No.</b>      | <b>Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CINC-R1.</b> | <p><b>Conduct a separate complete evaluation for the CINC program:</b> In 2010, only one new construction project was included in the C&amp;IC program. This project was implemented using a “whole building” approach and its savings accounted for a small percentage of total C&amp;IC program impacts. As mentioned previously, the CINC program included nine projects in 2011 and generated almost 3 GWh per year of gross savings at the generator. The impacts of the CINC program are also expected to increase in the upcoming years. Accordingly, Econoler believes ENSC should conduct a separate complete evaluation for the CINC program in 2012. Moreover, a separate evaluation could help shed light on some uncertainties in calculating the savings related to CPG compliance (technical documentation, building simulations from the Advanced Buildings Institute (ABI), potential demand savings, etc.).</p> |
| <b>CINC-R2.</b> | <p><b>Compare the actual building consumption with the design simulations and make appropriate adjustments (if required):</b> In regard to M&amp;V activities that are undertaken up to three years following program completion, the Evaluator recommends comparing the building real consumption to the modeling results. This will help appreciate the level of discrepancy between simulation and reality, and adjust the software results if necessary. If the program allows the use of different software, this comparison could help identify which one is closest to reality. It was mentioned that ABI would do this comparison when data is available.</p>                                                                                                                                                                                                                                                             |

- CINC-R3. Clearly define the CPG minimum requirements at the early stage of the CINC projects:** The Evaluator noticed that the M&V step of the program process was an issue for program participants who conduct their projects under the NCCP path. The verification partner met during the process evaluation also highlighted this matter. With this in mind, the Evaluator recommends providing the participants with the standardized minimum requirements document as soon as possible in the project process (at least before starting the construction work). Moreover, the Evaluator encourages ENSC to add more detail to the minimum requirements documents as well as to draw up a set of examples and/or templates of requirement documents that would comply with the CPG. This could help the participants ensure that they prepare and provide the proper documentation.
- CINC-R4. Add a limited amount of peak demand savings in project impact calculations:** For 2011, ENSC did not calculate electricity demand savings for the CINC projects. When reviewing the New Buildings Institute's simulations, the Evaluator noted that demand savings had actually been estimated for each building type. Even though such demand savings are very small per project, they could raise the overall impact of the program with future increases in the number of program participants.

#### **4.2.4 Small Business Energy Solutions Program**

The 2011 evaluation of the SBES program demonstrated that the program is well designed and that its participant base keeps growing from one year to the next. The program totalled 1,468 participants for the year 2011, which was a substantial increase compared to the previous year (801 participants). The evaluation revealed that the SBES program had generated net energy savings of 23.180 GWh and demand savings of 6.81 MW at the generator in 2011. To calculate the net savings of the SBES program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from the on-site visits and included interactive effects for lighting products. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey.

Participants mentioned recommendations to improve the program that mainly relied on communication; e.g., increasing marketing and advertising, providing more information and improving interactions with program representatives. Participants declared that most of the information received about the program had been obtained by word of mouth. Had it not been for the latter, they would never have heard about the program or been informed about the different program components. The program partners interviewed agreed that program marketing and advertising needed to be improved.

Econoler finds that the program works well overall and at a satisfactory level. The Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

**Table 27: Recommendations for the Small Business Energy Solutions Program**

| No.             | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SBES-R1.</b> | <p><b>Improve the tracking sheet to allow for a better validation of savings:</b> Currently, the tracking sheet does not detail the components comprised in each measure, including the installation of occupancy sensors and the unitary wattage value used for savings calculations. Accounting for these details would allow the Evaluator to differentiate two measures with similar equipment but different key components (like ballasts) and to validate savings calculations. Moreover, wattage values that were found to be incorrect during the evaluation should be modified in the Demand Side Management Data System. Correcting these values will ensure that uniform wattage values are used for savings calculations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>SBES-R2.</b> | <p><b>Enhance marketing and advertising to increase program awareness:</b> In spite of their high level of satisfaction with regard to the program, participants' recommendations to improve the program mainly relied on communication. Program participants wish to see more marketing and advertising, more interaction with program representatives and more information on the program. Moreover, most participants mentioned having learned about the program by word of mouth only; otherwise, they would not have known about the program or any of its components. The program partners interviewed did agree also that improvements need to be made to program marketing and advertising as a share of customers who could be aware of the program are not. To that effect, they suggested creating a mailing list to promote the program in its designated area. They also recommended targeting landlords and property management companies in large city areas to open opportunities in larger non-residential buildings. Overall, participants as well as program partners agree that broader marketing efforts should be deployed to increase program awareness.</p> |
| <b>SBES-R3.</b> | <p><b>Require additional information during survey campaigns with commercial and industrial (C&amp;I) customers as well as from participants to better estimate the interactive effects factor and increase the number of on-site visits conducted:</b> Collecting information on the heating source and on the use of air conditioning from each participant of the SBES program and during C&amp;I survey campaigns would provide a better evaluation of the interactive effects factor and of net program savings. Moreover, the number of sites should be increased. This would allow installing data loggers to monitor lighting hours of operation at more sites and obtaining a more reliable self-declaration ratio. Increasing the number of on-site visits would also allow calculating more reliable installation ratios.</p>                                                                                                                                                                                                                                                                                                                                            |

- SBES-R4. Revise the list of products eligible for an incentive through the SBES program:** Restricting eligibility to high-end products like LED lamps or high-performance T8 lighting systems that business owners would not likely install on their own could help reduce the free-ridership level obtained for the program. Currently, the program includes several products that are already very common, and that facility managers might install on their own. Keeping these products in the program yields higher free-ridership levels.



## **5 ENERGY EFFICIENCY PROJECTS AT NEW PAGE**

As part of the 2011 Efficiency Nova Scotia Corporation (ENSC) program evaluation, Econoler was also requested to analyze and evaluate energy and demand savings results from a measurement and verification (M&V) report for the New Page paper mill in Port Hawkesbury, Nova Scotia. The M&V report was produced by EPS and is titled “Detailed Review of Completed Energy Efficiency Projects at New Page, Port Hawkesbury,” October 17, 2011.

The report methodology adhered to the Superior Energy Performance (SEP) Measurement and Verification Protocol. This protocol is based on best practices found in the International Performance Measurement and Verification Protocol (IPMVP), a recognized evaluation tool for individual energy efficiency projects. The SEP protocol also includes a specific requirement to conduct both a top-down and a bottom-up “sanity check” analysis that provides a higher level of confidence in the results than would a single approach.

The top-down analysis concludes that energy savings of 154.2 GWh and demand savings of 17.8 MW are a result of the projects. The top-down analysis found a savings that is 26 percent higher than the sanity check evaluation that resulted in estimated savings of 122 GWh. This difference was noted by the evaluation team and discussed with both the EPS team and the New Page representative during the interview that followed the report review.

The Evaluator concludes that the savings evaluated in the report are a fair representation of the savings generated by the energy efficiency projects at the New Page, Port Hawkesbury plant.

The difference between the top-down approach and the bottom-up approach is relatively high at 26 percent, but there are several elements that were not included in the bottom-up approach that can explain the difference in savings calculated. Among those is the optimization of the operation of the most efficient line and the increased quantity of TMP pulp produced internally at the plant. The utilization of the top-down savings vs. the bottom-up savings approach adheres to the SEP protocol for plant energy savings evaluation.

The Evaluator concludes that annual energy savings of 154.2 GWh and demand savings of 17.8 MW are a fair representation of the energy efficiency projects.



# **EFFICIENT PRODUCTS – APPLIANCE RETIREMENT PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Appliance Retirement (ARet) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM), the delivery agent (DA) and two contractors, on two on-site visits as well as on a telephone survey of 90 program participants.

## **PROGRAM OVERVIEW**

Launched as a pilot program in 2010 and continued in 2011, the ARet program allowed participants to have appliances removed from their premises by contacting an external call center or by registering on the Efficiency Nova Scotia Corporation (ENSC) website. In 2011, in addition to refrigerators, freezers and dehumidifiers, participants could also retire room air conditioner units. In exchange for their appliance, participants received a \$35 rebate for each refrigerator or freezer and \$10 for each dehumidifier or room air conditioner. To be eligible, appliances had to be plugged in, in working order and older than 10 years.

The program collaborated with a DA, Summerhill Group. An external call center, a transportation service and a recycler also acted as program partners in 2011 since the units were sent to be recycled once removed from the premises.

The program aimed at achieving net electricity savings of 7.27 GWh and demand savings of 1.16 MW for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the ARet program demonstrated that the program is well designed and revealed an important level of participation considering the fact that it is still a fairly new program. The program achieved the retirement of 8,211 units for the year 2011. In terms of net energy savings, it generated 7.175 GWh at the generator, which represents an increase in comparison to 2010 net savings (2.14 GWh).

### **Awareness**

In order for the number of participants to remain as high as it was in 2011 and to ensure program continuity in the years to come, program awareness constitutes an important aspect of the overall strategy. The evaluation revealed that the main source of awareness of the ARet program comes from advertising in the newspaper, on the radio or on TV. These results highlight the positive impact of the marketing efforts on customer awareness as well as on the high number of participants.



It is notable that marketing efforts contributed to program success in 2011. However, participants still believe that improvements are possible. Indeed, when asked on recommendations to improve the program, participants first mentioned better advertising.

Despite the DA's involvement in program marketing design and development, the DA was on the same page as participants as they expressed a lower satisfaction level towards the outreach and marketing activities. They mentioned the difficulties of working in collaboration with the third party marketing agency as it had no previous program expertise and little understanding of how program results were tied to advertising and marketing. According to them, this created a barrier to implementing an effective and engaging marketing campaign.

On a different note, survey results revealed that a majority of the 2011 participants knew that the appliances retired through the program would be recycled. In spite of that, a significant proportion of participants were not aware of it. Therefore, more information on appliance disposal could be provided to participants as it represents an important and distinctive component of the ARet program.

## **Satisfaction**

Satisfaction towards the program was very high among participants. Indeed, almost all participants (96%) expressed their satisfaction with the program. Moreover, almost all participants (98%) reported that they would recommend the ARet program to a friend or family member, which is a strong indicator of satisfaction.

The program partners interviewed were also very satisfied with the overall program as well as with their relationship with one another and with other contractors, such as the call center. Along with their high level of satisfaction, one of the program partners identified a recommendation that would greatly impact their work. To improve the program, the transport contractor suggested implementing a more complex recording system of the units' ID code bar. In the transport contractor's view, a tracking system from pick-up to timely recycling would strengthen the current system.

## **Program Energy Savings**

To calculate the net savings of the ARet program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from a metering study conducted at the recycling facility and from other studies for similar programs. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey. Through this approach, a free-ridership level of 22 percent was captured, while a spillover level of 1 percent was identified.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 22%         |
| Spillover Level      | 1%          |
| Net-to-Gross Ratio   | 0.79        |

The evaluation revealed that the ARet program had generated net energy savings of 7.175 GWh and demand savings of 1.144 MW at the generator in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>NTGR</b>  | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------|--------------------|
| <b>Energy Savings</b>     |                              |              |                    |
| Tracked Savings from ENSC | 5.661 GWh                    | 0.74         | 4.189 GWh          |
| <b>Evaluation Results</b> | <b>9.020 GWh</b>             | <b>0.80*</b> | <b>7.175 GWh</b>   |
| <b>Demand Savings</b>     |                              |              |                    |
| Tracked Savings from ENSC | 0.903 MW                     | 0.74         | 0.668 MW           |
| <b>Evaluation Results</b> | <b>1.439 MW</b>              | <b>0.80*</b> | <b>1.144 MW</b>    |

\* A NTGR of 0.79 was used for appliances retired through the ARet program and of 1 for appliances retired through the RMP in-store weekend events.

The evaluated net savings exceeded those tracked by ENSC by 71 percent. This result was mainly due to the revision of the unitary savings values for each type of appliances. For refrigerators and freezers, the review was based on metering data, which allowed taking into account the actual condition of the old appliances retired and their degradation over the time. For dehumidifiers and room air conditioners, Econoler used the results from a metering study conducted in Ontario for the evaluation of the Every Kilowatt Counts program.

The net-to-gross ratio was evaluated at 0.79 for appliances retired through the program, which is slightly higher than what was used in the tracking sheet.

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the program:

- ARet-R1. Strengthen the marketing strategy:** The 2011 evaluation results highlight the importance of marketing and advertising in the promotion and awareness of the ARet program. Indeed, most participants have read or heard about the program in newspapers, on the radio or on TV. The high number of participants is also a strong indicator of the impact of marketing on program awareness. However, both the DA and the participants have shared their desire to improve program marketing and advertising. The present recommendation stresses the necessity to continue improving the marketing strategy to fulfill both partner and participant requests for better and more effective marketing. Moreover, marketing and advertising should be oriented towards the main program barrier identified, which is the reluctance to dispose of an appliance that still works.
- ARet-R2. Ensure that all information necessary for evaluation purposes is collected in the tracking sheet:** The PM together with the evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. For instance, the year of manufacture and the size in cubic feet of the old refrigerators and freezers retired were very useful to the Evaluator in order to estimate the average energy consumption of these appliances. For dehumidifiers and room air conditioners, such information was not available. It would be useful to have at least the capacity, in litres per day, for dehumidifiers and in Btu per hour for room air conditioners, which is a key determinant of energy consumption for those appliances.
- ARet-R3. Pursue the metering of refrigerators and freezers at the recycling facility:** For refrigerators and freezers, the unitary savings calculation was based on metering data, which allowed taking into account the actual condition of the old appliances retired and their degradation over time. For the next evaluation, Econoler recommends pursuing this approach by metering the energy consumption of a representative sample of refrigerators and freezers retired during the year. Thus, it is no longer necessary to ask the recycler to collect the theoretical energy consumptions of the appliances in the tracking sheet but it remains important to monitor the size and the age of the appliances retired, which are two parameters used in the unitary savings calculation.
- ARet-R4. Conduct on-site metering for dehumidifiers and room air conditioners:** The metering conducted at the recycling facility included the consumption measurement of 29 dehumidifiers and 12 room air conditioners retired through the program. However,

the results obtained from this metering study could not be used in this evaluation. Econoler suspected that the environment conditions at the recycling facility were not representative of those found in homes when these appliances are in function, typically during the summer. Therefore, Econoler recommends considering on-site metering to be carried out next summer in homes that operate old dehumidifiers and room air conditioners and that have manifested their desire to retire their old appliances.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Appliance Retirement (ARet) program began as a pilot program in 2010 in the Halifax and Cape Breton Regional Municipalities. In 2011, it ran from February until December and expanded to include all of Nova Scotia. A new product was also added to the initial list of appliances that could be retired through the program. In addition to refrigerators, freezers and dehumidifiers, participants can now retire room air conditioner units. In order to be eligible, all appliances must be plugged in, in working order and older than 10 years.

Participants can register to have their appliance(s) picked up by contacting a call center or by registering on the ENSC website. In addition to free recycling of the old appliance, customers are offered a \$35 rebate for each refrigerator or freezer and \$10 for each dehumidifier or air conditioner retired.

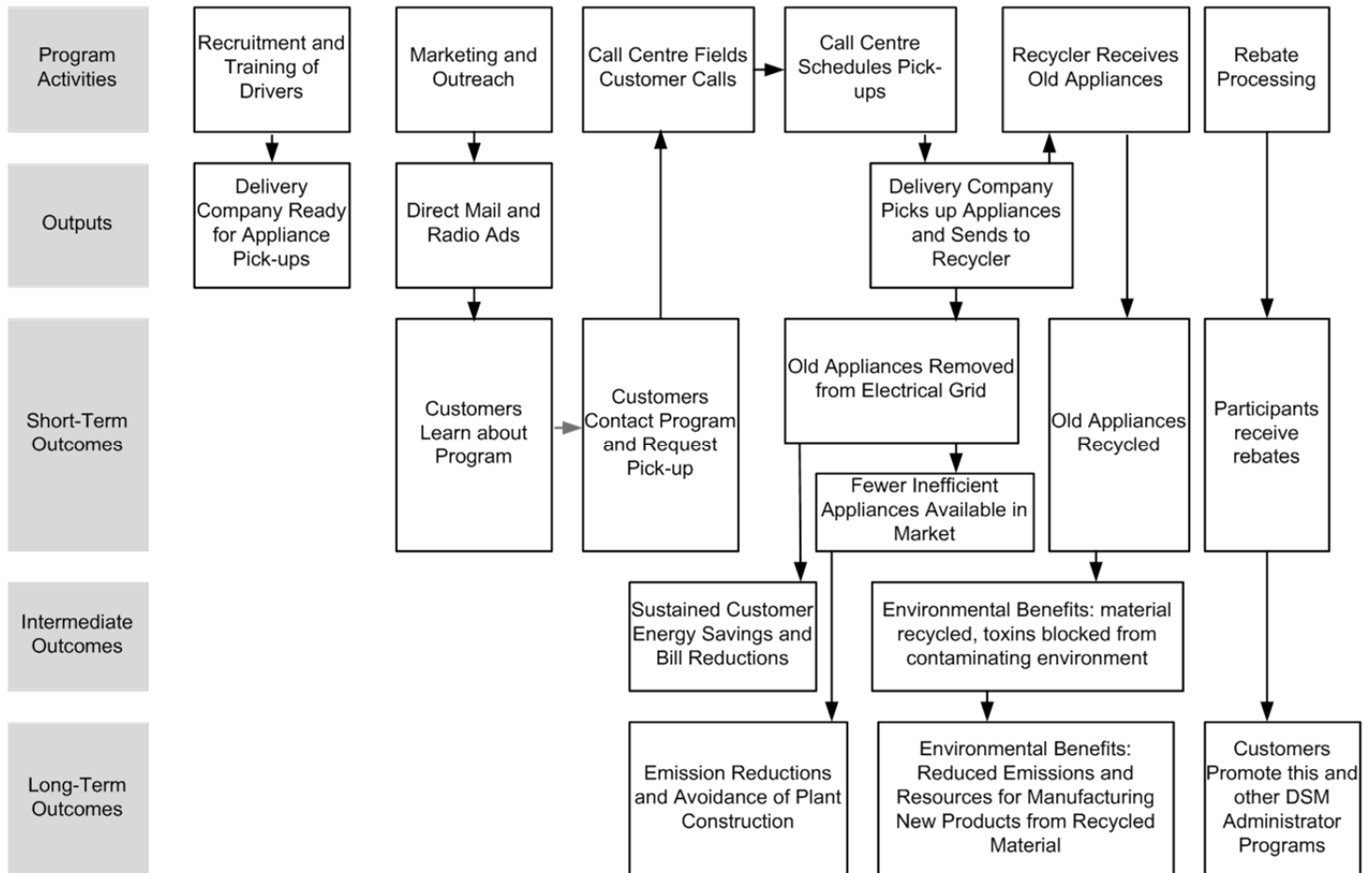
The program employs a delivery agent, Summerhill Group, and several sub-contractors such as an external call center, a transportation service and a recycler. As mentioned, the program not only removes the old appliances from the premises but also ships them to a recycling facility where over 95 percent of the units are environmentally recycled.

In 2010, the program far exceeded its target by retiring 3,354 appliances, whereas the initial target was 2,000 appliances. In 2011, the program aimed at achieving net electricity savings of 7.27 GWh and demand savings of 1.16 MW. In 2010, the ARet program generated net electricity savings of 2.14 GWh.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Efficient Products – Appliance Retirement Program Logic Model**

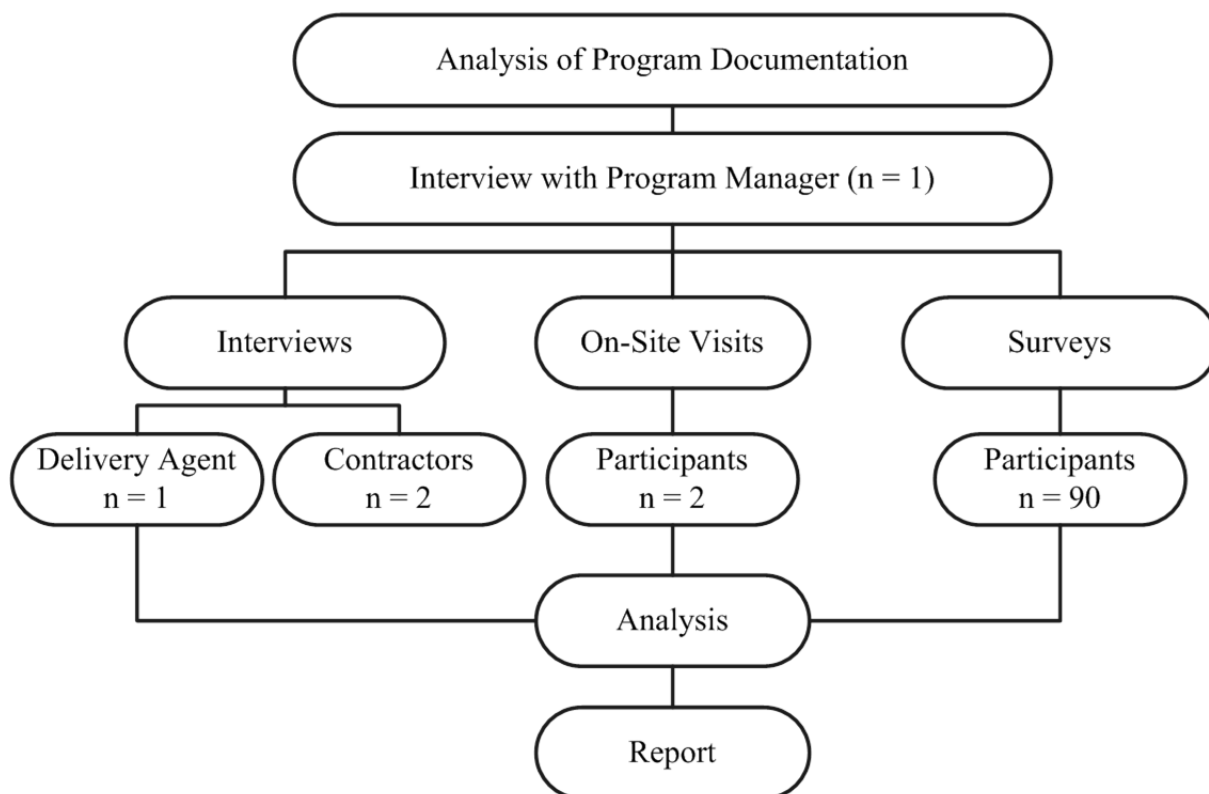


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices III, IV, V and VI.

**Figure 2: Methodological Model**



## 2.2 METHODOLOGY DESCRIPTION

### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the ARet program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual; and
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interviews for the process evaluation was finalized.

### **2.2.3 In-Depth Interviews with Program Partners**

In September, in-depth interviews were conducted with program contractors and the delivery agent. These interviews were intended, among other things, to understand the partners' involvement with the program, their participation process as well as their perception and satisfaction with the program.

### **2.2.4 On-Site Visits**

In November, two on-site visits were conducted at households that had retired an appliance through the ARet program. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These visits were used to gather information on the units retired (e.g., usage, primary or secondary unit) and the actions taken afterwards by homeowners (e.g., presence of a replacement unit). The specifications of the appliance were also collected when a new or used appliance replaced the unit retired.

The methodology used for the on-site visits for the ARet program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VII.



## 2.2.5 Participant Survey

A telephone survey with a total of 90 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in November utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 16 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > how participants learned about the program;
- > participant motivations and concerns;
- > characteristics and usage of appliance(s) retired;
- > replacement of appliance(s) retired;
- > spillover and free-ridership;
- > impact of program; and
- > satisfaction with the program.

The products covered through the survey were refrigerators, freezers and dehumidifiers.

The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

|                    | 2010       |                 |                                           | 2011       |                 |                                           |
|--------------------|------------|-----------------|-------------------------------------------|------------|-----------------|-------------------------------------------|
|                    | Population | Sample Size (n) | Sampling Error at 90% Confidence Interval | Population | Sample Size (n) | Sampling Error at 90% Confidence Interval |
| Refrigerators      | 2,341      | 36              | ±13.6%                                    | 4,022      | 45              | ±12.1%                                    |
| Freezers           | 1,405      | 28              | ±15.4%                                    | 2,505      | 40              | ±12.9%                                    |
| Dehumidifiers      | 706        | 15              | ±21.0%                                    | 742        | 12              | ±23.5%                                    |
| Total <sup>1</sup> | 3,675      | 70              | ±9.7%                                     | 6,498      | 90              | ±8.5%                                     |

<sup>1</sup> It is to be noted that categories of household appliances are not mutually exclusive. As a result, the total number of participants in the three appliance groups is not equal to the total number of participants (both in terms of population and sampling). Indeed, participants may have retired more than one appliance under the program. Additionally, the population of participants does not include the 98 participants who only retired room air conditioner units through the program since the survey included questions only on the three most important appliances: refrigerators, freezers and room air conditioners. Considering all appliance types, the total population of participants in the program amounts to 6,596.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted for the ARet program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

The process evaluation was performed through in-depth interviews with the PM and with the program partners as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The ARet program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what was found in the ARet program manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | ARet Program Manual |
|--------------------------------------------------------------------------------------------------------------|---------------------|
| Document revisions                                                                                           | ✓                   |
| Program description (including nature or type of program)                                                    | ✓                   |
| Program justification                                                                                        | ⊘                   |
| Program objectives                                                                                           | ✓                   |
| Incentives                                                                                                   | ✓                   |
| Eligibility criteria                                                                                         | ✓                   |
| Program partners and their roles                                                                             | ⚠                   |
| Program barriers                                                                                             | ✓                   |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                   |
| Details about the savings calculations and type of measures                                                  | ⊘                   |
| Budget per year                                                                                              | ✓                   |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                     | ARet Program Manual |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Cost-effectiveness test results                                                                                                                                                                                                                                                                                                                                            | ✓                   |
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                              | ⊘                   |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                             | ⊘                   |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                            | ⊘                   |
| Program theory                                                                                                                                                                                                                                                                                                                                                             | ⚠                   |
| Logic model                                                                                                                                                                                                                                                                                                                                                                | ✓                   |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                 | ⊘                   |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                  | ✓                   |
| Program forms                                                                                                                                                                                                                                                                                                                                                              | ⊘                   |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                     |

Econoler has analyzed the ARet program manual. It contains relevant information useful for both the PM and the Evaluator. The eligibility criteria and the incentives offered are well documented in the manual. However, Econoler has the following recommendations in order to supplement and improve the tool:

- > **Provide a “base case”:** The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. For refrigerators and freezers, they are calculated on a case-by-case basis, using the real consumption of the appliance(s), as provided by EnerGuide databases or others. For dehumidifiers and air conditioner units, the algorithm uses a base consumption value. The methodology and the databases used to identify each of these variables should be available and documented for validation and updating purposes.
- > **Provide the parameters used to estimate the program objectives:** After having estimated the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. Moreover, the parameters should be continually adjusted based on the most recent evaluation results.

- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. The plans should also identify for each activity the performance indicators that should be collected for monitoring and evaluation purposes.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing that would serve as “program memory” in case of modifications or staff changes. For instance, it is not mentioned that not only secondary units can be retired through the program but primary units as well, as detailed in the tracking sheet. The program manual content should be regularly updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of the tracking sheet for the appliance retirement program. In general, the tracking sheet is useful and provides the PM with a way to continuously monitor program savings. The necessary fields for program administration and evaluation purposes are present but some improvements could be made to make this tool a better asset for the PM and the evaluator.

The tracking sheet presents information in two separate sheets: one lists the customer information and the other retired appliance details. Each project has a unique identification number which links customer participation to the type of appliance retired and the specific characteristics of each appliance. All the customer information necessary for conducting field activities (surveys and on-site visits) was present in the tracking sheet. However, some fields presenting the characteristics of retired appliances and details on replacement models (when applicable) are not filled in systematically. This information might not be essential for program administration purposes but would be useful for its evaluation. Moreover, at the time of conducting this analysis, three retired appliances found in the tracking sheet were under 10 years old, which is under the age limitation of the program. The Evaluator considers this number acceptable given that participants are selected based on customer declaration and that the actual age of the appliance is corrected by the recycler once it is at the plant. Therefore, since it remains relatively low, Econoler accepts the fact that a few appliances under the age limitation of the program can slip through.

Estimated annual energy consumptions are filled in by the recycler for each appliance. For refrigerators and freezers, the annual energy consumption reported corresponds to the EnerGuide rating found on the appliance (when available). When the EnerGuide rating is missing, the recycler uses average energy consumption values based on the model year. For appliances manufactured after 1980, the yearly average consumption value per size is obtained from a database built by the recycler. This database is based on the EnerGuide values of more than 500,000 appliances that the recycler has retired in the past

years. For appliances manufactured between 1970 and 1980, the average consumption values are calculated for the decade, using the consumption data reported from the Canadian Appliance Manufacturers Association (CAMA). For the 1950s and 1960s, an average per decade is used based on an extrapolation from the peak consumption period (1,726 kWh/y in mid 1970s) to the previous year. The extrapolation is based on the fact that the units, in the 1950s and 1960s, were smaller and had fewer energy-consuming features. For dehumidifiers and room air conditioners, the average energy consumption value used in the tracking sheet was obtained through a two-hour consumption test conducted on dehumidifiers during the pilot project.

The program tracking sheet was also evaluated by the PM during the interview. The PM is satisfied with the tracking sheet and considers it easy to use. However, some adjustments could be made in the future to improve tracking sheet consistency and program evaluation. The evaluator recommends the following:

- > **Facilitate tracking of savings by using adjusted unitary savings values:** In 2011, a metering study was conducted as part of this evaluation. The results were used to estimate the unitary savings values for each type of appliances retired through the program according to various parameters such as the average size of the retired refrigerators, the occupant adjustment factor, the replacement ratio, the partial use factor and the lab-to-on-site factor. In the future, these unitary savings values should be used to monitor gross energy savings in the tracking sheet. Then, the values should be adjusted after each evaluation.
- > **Determine the required fields and remove unnecessary ones:** The PM together with the evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. Conversely, the fields that are not utilized should be removed from the tracking sheet in order to concentrate the efforts on the essential. For instance, the year of manufacture and the size in cubic feet of the old refrigerators and freezers retired were very useful to the Evaluator in order to estimate the average energy consumption of these appliances. For dehumidifiers and room air conditioners, such information was not available. It would be useful to have at least the capacity, in litres per day, for dehumidifiers and in Btu per hour for room air conditioners, which is a key determinant of energy consumption for those appliances. Information on the number of months the appliance is used could also be useful in order to estimate the partial use factor for refrigerators and freezers and the annual usage of dehumidifiers and air conditioners.
- > **Standardize the entries and fix limitations:** To avoid entering the same information in different ways, ENSC should integrate a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the number of data entry errors. For instance, in the 2011 tracking sheet, Econoler found six different ways of spelling “Halifax,” which complicated data coding for selecting the on-site visit sample. Additionally, a drop-down list will limit the choices of answers and allow rapidly identifying non-eligible products. Limitations could also be added to the system in order to indicate the fields that have to be filled depending on appliance

type and prior entries. Finally, a quick validation process should be developed and applied to the tracking sheet to flag inconsistencies and missing entries.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, Econoler concludes that the program is well designed and represents an important level of participation considering the fact that it is still a fairly new program. A certain number of improvements have already been made to the program. For instance, in order to solve communication problems that can emerge between parties from the high number of organizations involved in the program, the coordination of the call center and the pick-up service is now under the direct responsibility of the delivery agent, as opposed to its subcontractors. A participant process flow chart was also developed by ENSC in order to make the program participation procedures clearer. However, Econoler has identified potential means of improving program design and implementation. The following are comments and recommendations that would have an impact on the design and delivery of the program:

- > **Focus the marketing efforts on customers' reluctance:** One of the main program barriers identified is the customers' resistance to get rid of a working appliance. Econoler recommends that the marketing strategy be oriented towards that specific barrier.
- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.

### **3.5 ENSC WEBSITE**

Customers can consult the ENSC website to find useful information regarding the program, such as the rebate amounts and eligibility criteria for the retirement of the appliances. The website also provides access to online enrolment for participants, which is considered as a program asset by Econoler. The online booking may contribute to the positive evaluation of survey respondents as to the ease of participation in the program (see Section 3.7.1 for additional information).

As part of the evaluation, Econoler noticed erroneous information about the recycling company name in the Q&A section. ENSC has quickly addressed this issue and the website is now updated.

### **3.6 RELATIONSHIP WITH PROGRAM PARTNERS**

Three program partners were interviewed under the process evaluation of the ARet program: the delivery agent, the transport contractor and the recycling contractor. Their level of satisfaction with their partnership with ENSC's team and the overall program is very high. They are also very satisfied with the relationship they had with one another and with other program partners, such as the call center.

The delivery agent considers the participation process to be simple. However, the transport contractor finds the participation process somewhat complex since it takes a fair amount of logistics to maintain the balance between the possible service and program costs. To that effect, the delivery agent and the transport contractor received several complaints from program participants. The nature of these complaints varies and includes missed pick-ups, lost cheques, minor damage and requests from customers for faster service. However, the fact that the coordination of the call center and the pick-up service is now under the responsibility of one contractor (the DA) is a considerable improvement and should reduce these errors.

The partners expressed their opinion on the program name change. While the delivery agent and the transport contractor believe that the former program name, "Pull the Plug," was more grabbing and more user friendly to customers, the recycling contractor mentions that the new name is more representative of the program itself.

The recycling and transport contractors were very satisfied with the outreach and marketing activities. However, the delivery agent expressed a lower level of satisfaction with that aspect of the program, explaining that dealing with a third party creative agency was difficult as it had no previous program expertise and little understanding of how program results were tied to advertising and marketing. There were multiple barriers in implementing an effective and engaging marketing campaign. The third party creative agency had to juggle diverse creative inputs and approvals which proved to be very difficult at times.

According to the program partners, the main barrier to the implementation of the program is the involvement of many subcontractors. It was mentioned that it was difficult to find reliable subcontractors such as a call center, a transporter and a recycling facility, not to mention that it still required careful planning as well as adequate program processes and logistics. As mentioned above by the delivery agent, implementing an effective marketing strategy is also identified as a barrier to the program. The participant survey results show that 13 percent of respondents recommended that the program be better advertised.

In order to improve the program, the transport contractor suggests implementing a more complex recording system of the units' ID code bars. In the transport contractor's view, a tracking system from pick-up to timely recycling would strengthen the system.

### 3.7 PARTICIPANT PERSPECTIVES

#### 3.7.1 Program Awareness and Enrolment

Similar to 2010 results, approximately one-half of respondents found out about the program through advertising in the newspaper, on the radio or on TV (46%). Two in 10 found out about the program from direct mail (21%) or by word of mouth (20%), while a small number mentioned the Internet (7%) or a store flyer (6%).

These results, combined with the high number of program participants, show that program marketing generated a good level of customer awareness.

**Table 5: How Participants Found Out About the Program**

| <b>Sources of Awareness*</b>                                   | <b>2010</b> | <b>2011</b> |
|----------------------------------------------------------------|-------------|-------------|
| <i>Sample Size</i>                                             | 70          | 90          |
| Utility/sponsor advertising in newspapers, on the radio, on TV | 49%         | 46%         |
| Bill insert/mailling from utility/sponsor                      | 17          | 21          |
| Co-worker, family or friend                                    | 20          | 20          |
| Internet-unspecified                                           | 10          | 7           |
| Store flyer                                                    | --          | 6           |
| Salesperson                                                    | 1           | 2           |
| ENSC/utility/sponsor website                                   | 3           | 2           |
| Appliance retailer/dealer                                      | 1           | --          |
| Other                                                          | 1           | 6           |
| Don't know/refused                                             | 1           | 1           |
| *Multiple responses                                            |             |             |



Most respondents enrolled in the program over the phone (86%) while the remainder signed up online (14%).

**Table 6: How Participants Enrolled in Program**

| Method of Enrollment | 2010 | 2011 |
|----------------------|------|------|
| <i>Sample Size</i>   | 70   | 90   |
| Over the phone       | 70%  | 86%  |
| Online               | 29   | 14   |
| Don't know/refused   | 1    | --   |

All respondents who enrolled online found the process easy, offering a rating of 5 or 4 where 1 is “extremely difficult” and 5 “extremely easy.” The vast majority of those who enrolled over the phone found the process easy (94% offering a rating of 5 or 4). Findings are generally consistent with those from 2010. The only respondent who had difficulty signing up over the phone (rating of 2) reported that it was hard to get hold of someone.

**Table 7: Ease of Program Enrolment by Phone and Online**

| Level of Ease of Program Enrolment | 2010                |                             | 2011                |                             |
|------------------------------------|---------------------|-----------------------------|---------------------|-----------------------------|
|                                    | Enrolled Online (%) | Enrolled Over the Phone (%) | Enrolled Online (#) | Enrolled Over the Phone (%) |
| <i>Sample Size</i>                 | 20                  | 49                          | 13                  | 77                          |
| 5 “Extremely easy”                 | 80%                 | 71%                         | 10                  | 78%                         |
| 4                                  | 20%                 | 18%                         | 3                   | 16%                         |
| 3                                  | --                  | 6%                          | --                  | 5%                          |
| 2                                  | --                  | 2%                          | --                  | 1%                          |
| 1 “Extremely difficult”            | --                  | 2%                          | --                  | --                          |
| <b>Average</b>                     | <b>4.8</b>          | <b>4.6</b>                  | <b>4.8</b>          | <b>4.7</b>                  |

Nine in 10 respondents found the process of scheduling the time for pick-up easy (90%), or a mean score of 4.6, which is consistent with findings from last year. From the three respondents who had difficulty scheduling pick-ups (rating of 1 or 2), two indicated that it was hard to get hold of someone and one indicated that the program representative had not shown up as planned.

**Table 8: Ease of Scheduling Time for Pick-up**

| <b>Level of Ease of Scheduling Time for Pick-up</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------------------------------|-------------|-------------|
| <i>Sample Size</i>                                  | <i>70</i>   | <i>90</i>   |
| 5 “Extremely easy”                                  | 71%         | 70%         |
| 4                                                   | 9           | 20          |
| 3                                                   | 11          | 7           |
| 2                                                   | 1           | 2           |
| 1 “Extremely difficult”                             | 6           | 1           |
| Don’t know/refused                                  | 1           | --          |
| <b>Average</b>                                      | <b>4.5</b>  | <b>4.6</b>  |

### 3.7.2 Participant Motivations and Concerns

Four in 10 respondents (43%) decided to get rid of their appliance through the ARet program because the old unit was not working well. One-third reported that they no longer needed the appliance (32%) while two in 10 wanted to reduce energy or electricity costs (21%). Approximately one in 10 decided to get rid of their old appliance because they had bought a new appliance (13%), because the program contractor would pick up their old appliance (12%), because of the rebate or incentive (12%) or because it was easy or convenient to turn it in (10%).

**Table 9: Why Participants Decided to Dispose of Appliance through the Program**

| Reasons for Appliance Disposal*                           | 2010              |              |                   | 2011        |
|-----------------------------------------------------------|-------------------|--------------|-------------------|-------------|
|                                                           | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) | Overall (%) |
| <i>Sample Size</i>                                        | 36                | 28           | 15                | 90          |
| Old unit was not working well                             | 6%                | 14%          | 3                 | 43%         |
| Didn't need it any more                                   | 3%                | 11%          | 1                 | 32%         |
| Reduce energy/electricity costs                           | 3%                | 14%          | 3                 | 21%         |
| Bought new refrigerator/freezer/dehumidifier              | 28%               | 18%          | 2                 | 13%         |
| Rebate/incentive                                          | 19%               | 36%          | 5                 | 12%         |
| They would pick it up                                     | 17%               | 21%          | --                | 12%         |
| Easy/convenient to turn it in                             | 22%               | 18%          | 3                 | 10%         |
| Better for the environment                                | 14%               | 11%          | 2                 | 2%          |
| Remodeling/expanding                                      | --                | --           | --                | 2%          |
| Wanted to recycle                                         | 8%                | 4%           | --                | 1%          |
| Did not want to pay disposal fee at dump/recycling center | 3%                | 7%           | --                | 1%          |
| Cost too much to have it picked up                        | 3%                | 4%           | --                | 1%          |
| Moving soon/just moved                                    | --                | 4%           | 1                 | 1%          |
| Trash collection would not accept                         | --                | --           | --                | 1%          |
| Save energy/electricity                                   | 6%                | --           | 3                 | --          |
| Reduce maintenance costs/appliance needed repairs         | --                | 4%           | --                | --          |
| Other                                                     | 8%                | --           | --                | 1%          |
| Don't know/refused                                        | 3%                | --           | --                | 2%          |
| *Multiple responses                                       |                   |              |                   |             |

Just over one-half of respondents believe that the appliance that was picked up by the program was then recycled (53%) while two in 10 believe that they eliminated hazardous materials such as CFCs and freon (20%). Additionally, two in 10 do not know what happened to the appliance after it was collected (22%) or believe that the appliance was “trashed” (sent to landfill, scrapped, crushed, etc.) (17%). These results are consistent with 2010 results. A majority of participants therefore know that appliances retired through the program are recycled. However, the program should communicate the information related to appliance disposal since a significant proportion of participants still do not know about this program component.

**Table 10: Appliance Disposal**

| <b>Appliance Disposal*</b>                                                       | <b>2010</b> | <b>2011</b> |
|----------------------------------------------------------------------------------|-------------|-------------|
| <i>Sample Size</i>                                                               | 70          | 90          |
| Appliance is recycled                                                            | 60%         | 53%         |
| Hazardous materials (CFCs, refrigerants, freon) within appliance are disposed of | 26          | 20          |
| Appliance is trashed                                                             | 10          | 17          |
| Appliance is sold for reuse                                                      | 4           | 11          |
| Other                                                                            | 4           | 6           |
| Don't know/refused                                                               | 20          | 22          |
| *Multiple responses                                                              |             |             |

Just two percent of respondents had concerns prior to taking part in the program. One respondent was concerned that the process would take too long while the other thought the process would be too complicated.

Thus, there does not seem to be any barriers to program participation as such. Survey results indicated that participants found it easy to participate. As mentioned in the program manual, the main program barrier among consumers is related to the reluctance to dispose of a device that still works.

**Table 11: Concerns prior to Taking part in the Program**

| <b>Concerns</b>    | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | 90          |
| Yes                | 2%          |
| No                 | 97          |
| Don't know         | 1           |

### 3.7.3 Old Appliances

Just over one-half of respondents who had a refrigerator removed indicated that this appliance was a second refrigerator (53%) while four in 10 had their main refrigerator removed (42%).

When considering all respondents who turned in a refrigerator through the program (n=45), results indicate that 4 percent of respondents, or two respondents, removed a refrigerator that was neither being used at all nor plugged in. This result will be taken into consideration in the partial use factor presented in the impact evaluation section.

**Table 12: Use of Removed Refrigerators**

| Use of Removed Refrigerators | 2010 | 2011 |
|------------------------------|------|------|
| <i>Sample Size</i>           | 36   | 45   |
| Used as primary/main         | 42%  | 42%  |
| Used as secondary/spare      | 56   | 53   |
| Not being used               | 3    | 4    |

The majority of respondents who recycled a secondary refrigerator or a freezer through the program had the appliance plugged in all the time while the majority of those with a dehumidifier had it plugged in occasionally.

**Table 13: Amount of Time Appliance was Plugged In**

| Time Plugged In                                                               | 2010                  |                 |                      | 2011                  |                 |                      |
|-------------------------------------------------------------------------------|-----------------------|-----------------|----------------------|-----------------------|-----------------|----------------------|
|                                                                               | Refrigerators*<br>(%) | Freezers<br>(%) | Dehumidifiers<br>(#) | Refrigerators*<br>(%) | Freezers<br>(%) | Dehumidifiers<br>(#) |
| <i>Sample Size**</i>                                                          | 21                    | 28              | 15                   | 26                    | 39              | 11                   |
| All the time                                                                  | 57%                   | 79%             | 4                    | 62%                   | 90%             | 2                    |
| Most of the time                                                              | 19%                   | --              | 8                    | 12%                   | 3%              | 1                    |
| Occasionally                                                                  | 19%                   | 11%             | 1                    | 19%                   | 5%              | 7                    |
| Never                                                                         | 5%                    | 11%             | 7                    | 8%                    | 3%              | 1                    |
| *Base: Respondents who turned in a secondary refrigerator through the program |                       |                 |                      |                       |                 |                      |
| ** Don't know/refused removed from calculations                               |                       |                 |                      |                       |                 |                      |

The majority of appliances were in working condition when participants decided to have them picked up through the program.

**Table 14: Condition of Appliances**

| <b>Condition</b>       | <b>2010</b>              |                     |                          | <b>2011</b>              |                     |                          |
|------------------------|--------------------------|---------------------|--------------------------|--------------------------|---------------------|--------------------------|
|                        | <b>Refrigerators (%)</b> | <b>Freezers (%)</b> | <b>Dehumidifiers (#)</b> | <b>Refrigerators (%)</b> | <b>Freezers (%)</b> | <b>Dehumidifiers (#)</b> |
| <i>Sample Size</i>     | 36                       | 28                  | 15                       | 45                       | 40                  | 12                       |
| Yes                    | 92%                      | 93%                 | 12                       | 87%                      | 93%                 | 10                       |
| Yes, but not that well | 8%                       | 7%                  | 3                        | 13%                      | 8%                  | 1                        |
| Refused                | --                       | --                  | --                       | --                       | --                  | 1                        |

### 3.7.4 Appliance Replacement Behaviours

One-half of respondents who turned in a refrigerator have since purchased another refrigerator (53%), while six in 10 who retired a freezer have done so as well (58%) and seven of the 12 respondents who retired a dehumidifier also ended up acquiring a new unit.

It is to be noted that 23 percent of participants who retired a refrigerator that was not a primary refrigerator have since replaced it.

**Table 15: Replacement of Appliances**

| <b>Replacement</b> | <b>2010</b>              |                     |                          | <b>2011</b>              |                     |                          |
|--------------------|--------------------------|---------------------|--------------------------|--------------------------|---------------------|--------------------------|
|                    | <b>Refrigerators (%)</b> | <b>Freezers (%)</b> | <b>Dehumidifiers (#)</b> | <b>Refrigerators (%)</b> | <b>Freezers (%)</b> | <b>Dehumidifiers (#)</b> |
| <i>Sample Size</i> | 36                       | 28                  | 15                       | 45                       | 40                  | 12                       |
| Yes                | 56%                      | 50%                 | 11                       | 53%                      | 58%                 | 7                        |
| No                 | 44%                      | 50%                 | 4                        | 47%                      | 43%                 | 4                        |
| Refused            | --                       | --                  | --                       | --                       | --                  | 1                        |

The majority of participants who have replaced the appliance they removed replaced it with a new model. However, a significant minority of respondents replaced their old refrigerator with a used model (33%).

The proportion of respondents who replaced their refrigerators with a new appliance is the same among participants who have replaced their main refrigerator (67%) or secondary refrigerator (67%).

**Table 16: Replacement Appliance – New or Used**

| Replacement<br>New/Used                                               | 2010                 |                 |                      | 2011                 |                 |                      |
|-----------------------------------------------------------------------|----------------------|-----------------|----------------------|----------------------|-----------------|----------------------|
|                                                                       | Refrigerators<br>(%) | Freezers<br>(%) | Dehumidifiers<br>(#) | Refrigerators<br>(%) | Freezers<br>(%) | Dehumidifiers<br>(#) |
| <i>Sample Size**</i>                                                  | 20                   | 14              | 5                    | 24                   | 22              | 7                    |
| New                                                                   | 95%                  | 86%             | 5                    | 67%                  | 82%             | 5                    |
| Used                                                                  | 5%                   | 14%             | --                   | 33%                  | 18%             | 2                    |
| Base: Respondents who replaced appliances retired through the program |                      |                 |                      |                      |                 |                      |
| ** Don't know/refused removed from calculations                       |                      |                 |                      |                      |                 |                      |

Sears is mentioned most often as the location where respondents purchased their replacement appliance. Other mentions include friends and relatives, the Internet or Costco. Some respondents also purchased their replacement freezer at Leon's or Future Shop.

**Table 17: Where Replacement Appliance was Purchased**

| Replacement Purchased                                                  | 2010              |              |                   | 2011              |              |                   |
|------------------------------------------------------------------------|-------------------|--------------|-------------------|-------------------|--------------|-------------------|
|                                                                        | Refrigerators (%) | Freezers (#) | Dehumidifiers (#) | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) |
| <i>Sample Size</i>                                                     | 20                | 14           | 7                 | 24                | 23           | 7                 |
| Sears                                                                  | 50%               | 5            | 3                 | 46%               | 30%          | 3                 |
| Friend/relative                                                        | 5%                | 3            | --                | 21%               | 13%          | --                |
| Internet                                                               | --                | --           | --                | 13%               | 4%           | --                |
| Costco                                                                 | --                | 2            | 1                 | 4%                | 9%           | 3                 |
| Got new/main primary appliance; using older one as spare               | --                | --           | --                | 4%                | --           | 1                 |
| Leon's                                                                 | --                | --           | --                | --                | 17%          | --                |
| Future Shop                                                            | --                | --           | --                | --                | 13%          | --                |
| Lowe's                                                                 | --                | --           | --                | --                | 4%           | --                |
| Yard sale                                                              | --                | --           | --                | --                | 4%           | --                |
| Canadian Tire                                                          | --                | 1            | 2                 | --                | --           | --                |
| Home Depot                                                             | 5%                | --           | --                | --                | --           | --                |
| Other                                                                  | 40%               | 3            | --                | 13%               | 4%           | --                |
| Don't know/refused                                                     | --                | --           | 1                 | --                | --           | --                |
| Base: Respondents that replaced appliances retired through the program |                   |              |                   |                   |              |                   |



Among respondents who replaced appliances retired through the program, the majority selected ENERGY STAR®-qualified appliance.

**Table 18: Replacement Appliances with ENERGY STAR Label**

| ENERGY STAR Label                                                     | 2010              |              |                   | 2011              |              |                   |
|-----------------------------------------------------------------------|-------------------|--------------|-------------------|-------------------|--------------|-------------------|
|                                                                       | Refrigerators (%) | Freezers (#) | Dehumidifiers (#) | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) |
| <i>Sample Size**</i>                                                  | 20                | 13           | 6                 | 22                | 23           | 7                 |
| Yes                                                                   | 95%               | 12           | 5                 | 82%               | 87%          | 6                 |
| No                                                                    | 5%                | 1            | 1                 | 18%               | 13%          | 1                 |
| Base: Respondents who replaced appliances retired through the program |                   |              |                   |                   |              |                   |
| ** Don't know removed from calculations                               |                   |              |                   |                   |              |                   |

### 3.7.5 Importance of Secondary Appliance

Respondents who removed a secondary refrigerator or freezer through the program were asked how important it was to have a spare refrigerator or freezer for household food storage. The results exhibited divergent opinions for each appliance type. Indeed, a secondary refrigerator is not that important to respondents (mean of 2.2 out of 5) while a freezer is important (mean of 3.8 out of 5).

Nevertheless, these results, combined with the fact that about half of the respondents replaced their appliance retired through the program (see Section 3.7.4), indicate the importance of secondary appliances for consumers. It could also explain consumer reluctance to get rid of a working appliance.

**Table 19: Importance of Secondary Refrigerator and Freezer**

| Importance of Secondary Appliance                                       | 2011          |            |
|-------------------------------------------------------------------------|---------------|------------|
|                                                                         | Refrigerators | Freezers   |
| <i>Sample Size</i>                                                      | 24            | 40         |
| 5 "Absolutely necessary"                                                | 8%            | 50%        |
| 4                                                                       | 8             | 18         |
| 3                                                                       | 21            | 13         |
| 2                                                                       | 17            | 5          |
| 1 "Not at all necessary"                                                | 46            | 15         |
| Don't know/refused                                                      | --            | --         |
| <b>Average</b>                                                          | <b>2.2</b>    | <b>3.8</b> |
| Base: Respondents with secondary refrigerators or who removed a freezer |               |            |

### 3.7.6 Appliances Remaining in Home

The majority of respondents have one refrigerator or freezer remaining in their home (73% and 58%, respectively). Eight of the twelve respondents who had a dehumidifier removed have one left in their home.

**Table 20: Appliances Remaining in Home after Program**

| Appliances Remaining | 2010              |              |                   | 2011              |              |                   |
|----------------------|-------------------|--------------|-------------------|-------------------|--------------|-------------------|
|                      | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) |
| <i>Sample Size</i>   | 36                | 28           | 15                | 45                | 40           | 12                |
| 0                    | 0%                | 46%          | 5                 | --                | 33%          | 3                 |
| 1                    | 81%               | 46%          | 9                 | 73%               | 58%          | 8                 |
| 2                    | 16%               | 7%           | 1                 | 18%               | 5%           | --                |
| 3 or more            | 3%                | --           | --                | 6%                | 5%           | --                |
| Refused              | --                | --           | --                | 2%                | --           | 1                 |

For those with refrigerators remaining, just over one-half reported that the first refrigerator is less than five years old (55%) while two in 10 have a refrigerator that is six to 10 years old (20%). A proportion of 23 percent of the respondents reported having a refrigerator that is more than 10 years old.

**Table 21: Age of Remaining Refrigerators**

| Age of Remaining Refrigerators | 2010                   |                         |                        | 2011                   |                         |                        |
|--------------------------------|------------------------|-------------------------|------------------------|------------------------|-------------------------|------------------------|
|                                | First Refrigerator (%) | Second Refrigerator (#) | Third Refrigerator (#) | First Refrigerator (%) | Second Refrigerator (#) | Third Refrigerator (#) |
| <i>Sample size</i>             | 36                     | 7                       | 1                      | 44                     | 11                      | 3                      |
| 0 to 5 years old               | 75%                    | 6                       | 1                      | 55%                    | 7                       | 1                      |
| 6 to 10 years old              | 17%                    | 1                       | --                     | 20%                    | 1                       | --                     |
| 11 to 15 years old             | 3%                     | --                      | --                     | 16%                    | 1                       | 1                      |
| 16 to 20 years old             | 6%                     | --                      | --                     | --                     | 1                       | --                     |
| More than 20 years old         | --                     | --                      | --                     | 7%                     | --                      | --                     |
| Don't know/ refused            | --                     | --                      | --                     | 2%                     | 1                       | 1                      |

For respondents with freezers remaining, the freezer is generally less than five years old (81%).

**Table 22: Age of Remaining Freezers**

| Age of Remaining Freezers | 2010              |                    |               | 2011              |                    |                   |
|---------------------------|-------------------|--------------------|---------------|-------------------|--------------------|-------------------|
|                           | First Freezer (#) | Second Freezer (#) | Third Freezer | First Freezer (%) | Second Freezer (#) | Third Freezer (#) |
| <i>Sample Size</i>        | 15                | 2                  | --            | 27                | 4                  | 2                 |
| 0 to 5 years old          | 13                | 1                  | --            | 81%               | 3                  | 1                 |
| 6 to 10 years old         | 1                 | --                 | --            | 15%               | 1                  | --                |
| 11 to 15 years old        | --                | --                 | --            | 4%                | --                 | --                |
| 16 to 20 years old        | --                | --                 | --            | --                | --                 | --                |
| More than 20 years old    | 7                 | 1                  | --            | --                | --                 | 1                 |
| Don't know/refused        | --                | --                 | --            | --                | --                 | --                |

Most dehumidifiers that are remaining in respondents' households are five years old or less.

**Table 23: Age of Remaining Dehumidifiers**

| Age of Remaining Dehumidifiers | 2010                   |                         | 2011                   |                     |
|--------------------------------|------------------------|-------------------------|------------------------|---------------------|
|                                | First Dehumidifier (#) | Second Dehumidifier (#) | First Dehumidifier (#) | Second Dehumidifier |
| <i>Sample Size</i>             | 10                     | 1                       | 8                      | --                  |
| 0 to 5 years old               | 10                     | 1                       | 7                      | --                  |
| 6 to 10 years old              | --                     | --                      | --                     | --                  |
| 11 to 15 years old             | --                     | --                      | --                     | --                  |
| 16 to 20 years old             | --                     | --                      | 1                      | --                  |
| More than 20 years old         | --                     | --                      | --                     | --                  |
| Don't know/refused             | --                     | --                      | --                     | --                  |

### 3.7.7 Program Influence

In terms of the importance of various factors in influencing the decision to remove the appliance through the program, removal and recycling being free was the most important influencer (mean score of 8.6 to 9.4 on a 0 to 10 scale where 10 is “extremely important”). This was followed by the information or advice received through the program (mean score of 6.4 to 7.5) and the \$35 incentive (mean score of 5.4 to 6.8).

**Table 24: Importance of Program in Influencing Decision to Remove Appliance**

| Importance of Program in Influencing Decision to Remove Appliance       | 2011              |              |                   |
|-------------------------------------------------------------------------|-------------------|--------------|-------------------|
|                                                                         | Refrigerators (%) | Freezers (%) | Dehumidifiers (#) |
| Sample Size                                                             | 37                | 34           | 10                |
| Mean where 0 is “not at all important” and 10 is “extremely important”  |                   |              |                   |
| Removal and recycling services provided for free as part of the program | 9.2               | 8.6          | 9.4               |
| Information or advice received through the program                      | 7.5               | 7.0          | 6.4               |
| The \$10 or \$35 incentive provided by ENSC                             | 6.8               | 6.0          | 5.4               |

### 3.7.8 Impact of Program

Respondents were asked to rate how much improvement they had noticed with respect to a number of areas. Six in 10 respondents offered a rating of 5 or 4 when assessing the level of improvement in terms of interest in energy efficiency (61%). Four in 10 saw improvements in their knowledge of energy efficiency (43%) or knowledge of appliances (40%) while just under four in 10 saw an improvement in the reduction of total energy costs (36%).

**Table 25: Level of Improvement**

| Level of Improvement                         | Sample Size | 2011<br>Rating: 5= “considerable improvement”<br>and 1= “no improvement” |    |    |    |    |    |     |
|----------------------------------------------|-------------|--------------------------------------------------------------------------|----|----|----|----|----|-----|
|                                              |             | 5                                                                        | 4  | 3  | 2  | 1  | DK | Ref |
| Your interest in energy efficiency improved  | 90          | 43%                                                                      | 18 | 17 | 7  | 13 | -- | 2   |
| Your knowledge of appliances improved        | 90          | 28%                                                                      | 12 | 24 | 8  | 26 | -- | 2   |
| Your knowledge of energy efficiency improved | 90          | 27%                                                                      | 16 | 21 | 12 | 21 | 1  | 2   |
| Reduction in total energy costs improved     | 90          | 24%                                                                      | 12 | 10 | 6  | 18 | 28 | 2   |

Most respondents did not report any negative consequences from removing their appliance through the program.

**Table 26: Program Drawbacks**

| <b>Drawbacks</b>                  | <b>2010</b> | <b>2011</b> |
|-----------------------------------|-------------|-------------|
| <i>Sample Size</i>                | <i>70</i>   | <i>90</i>   |
| No drawbacks                      | 91%         | 80%         |
| Loss of food storage space        | 4           | --          |
| Usable appliances are thrown away | 1           | --          |
| Other                             | 3           | 1           |
| Don't know/refused                | 1           | 19          |

### 3.7.9 Satisfaction with the Program

The majority of respondents are satisfied with the program overall, with eight in 10 (79%) offering a rating of 5 and two in 10 (17%) offering a rating of 4, where 1 is “extremely dissatisfied” and 5 “extremely satisfied.” The overall satisfaction score for this program is therefore very high (96%, or a mean of 4.7 out of 5).

**Table 27: Satisfaction with Program Overall**

| <b>Satisfaction with Program</b> | <b>2010</b> | <b>2011</b> |
|----------------------------------|-------------|-------------|
| <i>Sample Size</i>               | <i>23</i>   | <i>90</i>   |
| Mean                             | 4.3         | 4.7         |
| 5 “Extremely satisfied”          | 48%         | 79%         |
| 4                                | 26          | 17          |
| 3                                | 22          | 3           |
| 2                                | --          | --          |
| 1 “Extremely dissatisfied”       | --          | 1           |
| Don't know                       | 4           | --          |

Almost all respondents (98%) reported that they would recommend the ARet program. Only two respondents indicated otherwise. These respondents stated that it was too much trouble to participate in the program or that they felt that the organization did not know what it was doing.

The high proportion of respondents who would recommend the program is a strong indicator of satisfaction.

**Table 28: Recommended ARet Program**

| <b>Would Recommend ARet Program</b> | <b>2011</b> |
|-------------------------------------|-------------|
| <i>Sample Size</i>                  | <i>90</i>   |
| Yes                                 | 98%         |
| No                                  | 2           |

### 3.7.10 Participant Recommendations for Improvements

Seven in 10 respondents were unable to offer any recommendations to improve the ARet program (71%). A small number mentioned better advertising (13%), that wait times for pick-ups should be shortened (7%), there should be more products eligible for rebates (4%) or better communication in general (2%).

Some respondents mentioned waiting for around a month before their appliance was picked up by the program and therefore suggested shortening the waiting time. The recent responsibility change in the coordination of the call center and the pick-up service by the DA can improve this situation.

**Table 29: Recommendations for Improving Program in Future**

| <b>Recommendations*</b>                                                    | <b>2010</b> | <b>2011</b> |
|----------------------------------------------------------------------------|-------------|-------------|
| <i>Sample Size</i>                                                         | <i>70</i>   | <i>90</i>   |
| Better advertising/publicity/advertise the program more or in a better way | 9%          | 13%         |
| Improve scheduling/shorten wait for pick-up                                | 3           | 7           |
| Accept a wider variety of products                                         | 9           | 4           |
| Better communication                                                       | --          | 2           |
| Offer more information on the products/measures recommended                | --          | 1           |
| Offer program for longer period                                            | 7           | --          |
| Improve pick-ups (e.g., professionalism of haulers, etc.)                  | 7           | --          |
| Issue rebate check sooner                                                  | 4           | --          |
| Other                                                                      | 7           | 4           |
| No improvements needed                                                     | 7           | --          |
| No recommendations                                                         | 56          | 71          |
| *Multiple responses                                                        |             |             |

Four in 10 respondents (40%) do not believe a diagram illustrating the steps of the program would have facilitated participation while three in 10 (28%) believe such a diagram would have significantly facilitated participation.

The value of a diagram illustrating the steps of the program is rather mitigated among respondents, probably due to the ease of program participation. However, around half of respondents (46%) believe such a diagram would have been helpful. This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 30: Diagram Illustrating Steps of ARet Program would have Facilitated Participation**

| <b>Diagram Illustrating Steps of ARet Program would have Facilitated Participation</b> | <b>2011</b> |
|----------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                     | <i>90</i>   |
| Significantly                                                                          | 28%         |
| Somewhat                                                                               | 18          |
| Slightly                                                                               | 8           |
| Not at all                                                                             | 40          |
| This kind of document already exists                                                   | 1           |
| Don't know                                                                             | 6           |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the ARet program for 2011. Both energy and demand savings were considered in this evaluation. To do so, Econoler reviewed the following parameters:

- > adjusted unitary savings;
- > energy-to-demand ratio;
- > interactive effects;
- > free-ridership; and
- > spillover.

The review of the unitary savings calculations is mainly based on the metering activity conducted at the recycling facility as part of this evaluation. The impact evaluation is also the result of a literature review to compare the metering data with other jurisdictions and on-site visits.

Finally, the participant survey was used to estimate the free-ridership ratio and evaluate if the program had generated spillover.



### 4.1.1 On-Site Visit Sampling and Protocol

#### Sampling Methodology

Two on-site visits were conducted under the 2011 evaluation. The objective was simply to validate the program process and validate information presented in the tracking sheet. Since it was not used to collect information for impact evaluation, only two site visits were deemed necessary. The sampling was based on program tracking sheets that contained the list of participants and information about the appliances retired in 2011.

For the year 2011, the tracking sheet contained 6,596 projects. Econoler's analysis revealed that refrigerators were the most frequently retired appliance followed by freezers.

**Table 31: Total Quantity and Energy Savings for Each Appliance Type**

| Appliance Type        | Number of Units |             | Evaluated Energy Savings |             |
|-----------------------|-----------------|-------------|--------------------------|-------------|
|                       | Quantity        | %           | Sum of GWh               | %           |
| Refrigerators         | 4,280           | 52%         | 4.297                    | 53%         |
| Stand-Alone Freezers  | 2,593           | 32%         | 2.896                    | 35%         |
| Dehumidifiers         | 1,034           | 13%         | 0.910                    | 11%         |
| Room Air Conditioners | 304             | 3%          | 0.060                    | 1%          |
| <b>Total</b>          | <b>8,211</b>    | <b>100%</b> | <b>8.163</b>             | <b>100%</b> |

Since refrigerators and freezers covered 88 percent of estimated savings, the sampling was designed to contain one project including at least one refrigerator and one project including at least one freezer. The project with a refrigerator was selected randomly through the total number of projects containing at least one refrigerator and located in the region of Halifax or Dartmouth. The project with a freezer was selected randomly through the total number of projects containing at least one freezer and located in the region of Halifax or Dartmouth.

Even if a participant was selected for a refrigerator or freezer project, all appliances retired through the program were surveyed.

#### On-Site Visit Protocol

For each site visited, the evaluator interviewed the homeowner to collect information on the appliances retired and the actions taken afterwards. When a new or used appliance replaced the unit retired, specifications of this appliance were collected by the Evaluator to, among other things, determine whether the new appliance met ENERGY STAR specifications.

## 4.2 GROSS SAVINGS

Estimated savings for each appliance are not filled in the tracking sheet. Only the annual energy consumption of the retired appliances is noted by the recycler. No replacement ratio, replacement type, partial use factor and lab-to-on-site factor are taken into account in the tracking sheet.

For this year's evaluation, following one of the recommendations from the 2010 Savings Verification Study, a metering activity was conducted at the recycling facility to measure the energy consumption of old appliances retired through the ARet program. The metering protocol was based on the New York Technical Resource Manual for Multifamily Replacement Refrigerators<sup>2</sup> (as suggested in the 2010 Savings Verification Study report). This protocol served as a basis for developing an appropriate metering protocol for ENSC's program. It recommended conducting the metering tests for a minimum two-hour period, which is enough to cover three cycles. Under the ENSC approach, the units were tested during a metering test of 26 hours. The table below presents the number of units tested for each appliance retired through the program.

**Table 32: Number of Appliances Metered**

| Appliance             | Number of Units Retired | Number of Units Tested |
|-----------------------|-------------------------|------------------------|
| Refrigerators         | 4,280                   | 38                     |
| Freezers              | 2,593                   | 46                     |
| Dehumidifiers         | 813                     | 29                     |
| Room Air Conditioners | 225                     | 13                     |

The following sections present the calculation details for estimating the unitary savings value for each type of appliances retired through the program.

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<sup>2</sup> New York Department of Public Service, Technical Resource Manual for Multifamily Replacement Refrigerators, September 29, 2010.

### 4.2.1 Refrigerators

For the 2011 evaluation, Econoler reviewed the savings estimations used to monitor the gross savings generated by the refrigerators retired through the program. To do so, the following parameters were taken into consideration:

- > average consumption of refrigerators retired through the program (based on metering data);
- > percentage of refrigerators replaced after retirement;
- > average consumption of new and used replacement refrigerators;
- > partial use factor for secondary refrigerators; and
- > lab-to-on-site factor.

### Average Consumption of Retired Refrigerators

To establish the annual consumption of the refrigerators retired through the program, Econoler used the data from the metering activity. In total, the annual energy consumption of 38 refrigerators was tested during this activity.

In order to estimate an average consumption representative of the refrigerators retired through the program, the annual energy consumption measured for 36 refrigerators was analyzed per cubic foot and manufacture year. Below are the details of this analysis:

**Table 33: Average Metered Consumption Values for Retired Refrigerators**

| Manufacture Year                  | Average Annual Consumption<br>per Cubic Foot<br>(kWh/cu ft) | Proportion of Refrigerators<br>in the Tracking Sheet<br>(%) |
|-----------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| From ... to 1984                  | 84.2                                                        | 50%                                                         |
| From 1985 to 1994                 | 77.7                                                        | 38%                                                         |
| From 1995 to ...                  | 53.9                                                        | 12%                                                         |
| <b>Average Annual Consumption</b> | <b>78.1 kWh/cu ft</b>                                       |                                                             |

Based on the manufacture year of the retired refrigerators monitored in the 2011 tracking sheet, these average values were weighted to establish an average consumption value of 78.1 kWh per cubic foot.

The average size of the retired refrigerators monitored in the tracking sheet corresponds to 15.7 cubic feet. Based on this average value, Econoler calculated the average annual consumption for retired refrigerators.

$$\text{Average Consumption} = 78.1 \frac{kWh}{cu\ ft} \times 15.7\ cu\ ft = 1,226\ kWh$$

This average annual consumption of 1,226 kWh will be used for the unitary savings calculation of refrigerators retired through the program.

In the last evaluation, a degradation factor of 1.37 percent was used to adjust the average consumption of refrigerators according to their efficiency degradation over time. For this year's evaluation, the metering data already take into account the degradation of the appliances over time. Hence, no degradation factor needs to be applied to the average annual consumption calculated for retired refrigerators.

Econoler decided to use average annual consumption instead of calculating a degradation factor from the metering data. Two main reasons justified this decision: the fact that the metering data directly provided the annual consumption of the refrigerators and the fact that using a degradation factor involved having all theoretical consumption data of the refrigerators in the tracking sheet, which was not always possible. Moreover, this approach will facilitate the tracking of savings in the future. The average consumption calculated during this evaluation could be used in the 2012 tracking sheet for all the refrigerator models and then adjusted according to the average manufacture year and size in the next evaluation.

## **Replacement Ratio**

Among the refrigerators retired through the program, some were used as primary units and others as secondary units. After their retirement, these refrigerators can be replaced by other units. In those cases, the unitary savings value is different from that used for refrigerators retired and not replaced. In order to develop assumptions that are as accurate as possible, Econoler broke down the refrigerators into three different categories:

- > primary refrigerators retired and replaced;
- > secondary refrigerators retired and replaced; and
- > secondary refrigerators retired, but not replaced.

For the purposes of this evaluation, it was assumed that all primary refrigerators retired through the program were ultimately replaced. For secondary refrigerators, the participant survey was used to establish a replacement ratio. As mentioned in Section 3.7.4, from the participants who had secondary refrigerators retired through the program, 23 percent replaced them.

**Table 34: Replacement Ratio for Retired Refrigerators**

| Refrigerator Category    | Primary | Secondary |
|--------------------------|---------|-----------|
| <i>Sample Size</i>       | 19      | 26        |
| Retired and Replaced     | 100%    | 23%       |
| Retired and Not Replaced | 0%      | 77%       |

These assessments resulted in the following proportions for each category of refrigerators retired:

- > primary refrigerators retired and replaced:  $19/45 \times 100\% = 42\%$ ;
- > secondary refrigerators retired and replaced:  $26/45 \times 23\% = 13\%$ ;
- > secondary refrigerators retired, but not replaced:  $26/45 \times 77\% = 45\%$ .

### Average Consumption of Replacement Refrigerators

According to the participant survey (Section 3.7.4), when refrigerators were replaced, 67 percent were replaced with a new refrigerator and 33 percent with a used model. These proportions are the same among participants who have replaced their primary or secondary refrigerator.

In the 2010 evaluation, new replacement refrigerators were assumed to have an average energy consumption equivalent to the 2009 annual energy consumption estimates from the Association of Home Appliance Manufacturers (AHAM), which is of 450 kWh per year. For used replacements, it was found in the 2010 evaluation of the California Appliance Replacement program<sup>3</sup> that used appliances that were 5 to 10 years old had market value while appliances older than that did not. Therefore, an average energy consumption of 704 kWh was calculated from the 2000 AHAM and was applied for used replacements.

For this year's evaluation, different assumptions were used for new replacement refrigerators. The participant survey results revealed that, among respondents who had replaced their refrigerators, 82 percent selected ENERGY STAR-qualified models. In that case, the average energy consumption of new refrigerators was estimated at 363 kWh, based on the value calculated for the Efficient Products – Appliance Replacement (ARep) program using the manufacturer-reported energy consumption of ENERGY STAR products<sup>4</sup>. For the remaining 18 percent that were not replaced by ENERGY STAR-qualified models, Econoler used an average annual energy consumption value of 479 kWh corresponding to the 2008 estimates for refrigerators shipped in Canada from Natural

<sup>3</sup> CADMUS et al., Residential Retrofit High Impact Measure Evaluation Report, February 8, 2010.

<sup>4</sup> ENERGY STAR, Refrigerators Qualified Product List, [www.energystar.gov](http://www.energystar.gov), list posted on January 17, 2012.

Resources Canada<sup>5</sup>, assuming that no significant change had occurred since the 2010 evaluation. Indeed, according to Natural Resources Canada's Office of Energy Efficiency, the energy consumption of refrigerators has remained relatively stable since 2003.<sup>6</sup> Finally, as in the 2010 evaluation, used appliances that are 5 to 10 years old are assumed to still have market value. The results from our telephone survey confirmed this assumption. The average age of refrigerators in homes where the participants declared having replaced their old refrigerators with used units was 8 years old. Therefore, used replacement refrigerators were assumed to have an average energy consumption equivalent to 2003 annual energy consumption estimates from Natural Resources Canada, corresponding to 487 kWh per year.

**Table 35: Annual Energy Consumption Estimates for Replacement Refrigerators**

| Replacement Category        | New ENERGY STAR | New Standard Model | Used       |
|-----------------------------|-----------------|--------------------|------------|
| Source                      | ENERGY STAR     | 2008 NRCan         | 2003 NRCan |
| Energy Consumption (kWh/yr) | 363             | 479                | 487        |

By applying the percentages of refrigerators replaced by ENERGY STAR models and standard models, the average energy consumption for new refrigerators is equal to the equation shown below.

$$\text{Average Energy Consumption} = (82\% \times 363 \text{ kWh/yr}) + (18\% \times 479 \text{ kWh/yr}) = 384 \text{ kWh/yr}$$

## Partial Use Factors

For secondary refrigerators, Econoler established partial use factors to account for the fact that not all refrigerators are plugged in year-round. Secondary refrigerators are likely to be unplugged for a portion of the year and, since they were eligible for the program, partial use factors were developed to adjust the unitary savings calculations to this reality.

The participant survey was used to estimate the amount of time during which participants had their secondary refrigerators plugged in year-round prior to retirement. To do so, Econoler used the same plug-in patterns developed in the 2010 evaluation:

- > all the time – the refrigerator was plugged in for the entire year;

<sup>5</sup> Natural Resources Canada, Energy Consumption of Major Household Appliances Shipped in Canada, Trends from 1990-2008, p.8.

<sup>6</sup> Natural Resources Canada, Energy Consumption of Major Household Appliances Shipped in Canada, Trends from 1990-2008, p.11.

- > most of the time – the refrigerator was plugged in for nine months of the year;
- > occasionally – the refrigerator was plugged in for four months of the year;
- > never – the refrigerator was never plugged in during the year.

The partial use factor for secondary refrigerators replaced and not replaced was developed using the equation below.

$$\% = \left( \frac{12}{12} \times \% \text{ All the time} \right) + \left( \frac{9}{12} \times \% \text{ Most of the time} \right) + \left( \frac{4}{12} \times \% \text{ Occasionally} \right) + \left( \frac{0}{12} \times \% \text{ Never} \right)$$

For primary refrigerators considered as the main unit of the house, it is assumed that they were used all the time. The table below displays the partial use factors calculated for each category of refrigerators.

**Table 36: Partial Use Factor for Retired Refrigerators**

| Refrigerator Category     | Primary – Replaced | Secondary – Replaced | Secondary – Not Replaced |
|---------------------------|--------------------|----------------------|--------------------------|
| <i>Sample Size</i>        | 19                 | 6                    | 20                       |
| All the Time              | -                  | 4                    | 60%                      |
| Most of the Time          | -                  | 1                    | 10%                      |
| Occasionally              | -                  | 1                    | 20%                      |
| Never                     | -                  | 0                    | 10%                      |
| <b>Partial Use Factor</b> | <b>1.00</b>        | <b>0.85</b>          | <b>0.74</b>              |

## Lab-to-on-Site Factor

Energy consumption estimates from manufacturers are based on lab metering results where refrigerators are metered in a controlled environment. In order to account for field factors such as door openings, household size and indoor temperature, a lab-to-on-site factor should be applied to the energy consumption values estimated for replacement refrigerators based on manufacturer data. In the 2010 evaluation report, this factor was established at 0.82, based on the lab-to-on-site differences for primary and secondary refrigerators in cool climate zones<sup>7</sup> as reported in the 2010 evaluation of the California Appliance Retirement program<sup>8</sup>.

**Table 37: California Lab-to-on-Site Differences for Cool Climate Zones**

|                        | <i>Sample Size</i> | <i>Household Size</i> | <i>Lab-to-on-Site Factor</i> |
|------------------------|--------------------|-----------------------|------------------------------|
| Primary Appliance      | 29                 | 1-2                   | 1 - 0.308 = 0.692            |
|                        | 50                 | 3+                    | 1 - 0.160 = 0.840            |
| Secondary Appliance    | 86                 | 1-2                   | 1 - 0.213 = 0.787            |
|                        | 59                 | 3+                    | 1 - 0.068 = 0.932            |
| <b>Weighted Result</b> | <b>224</b>         | -                     | <b>0.82</b>                  |

For this year's evaluation, Econoler applied the same lab-to-on-site factor of 0.82 to the energy consumption values estimated for the replacement refrigerators based on manufacturer data.

For the retired refrigerators, no lab-to-on-site factor was applied to the annual consumption established from the metering data. In fact, the temperature under which the appliances were measured at the recycling facility (25°C) is similar to that found in Nova Scotia's households. The major difference between metering conditions and on-site conditions lies in the fact that the metering was conducted without accounting for door openings. The energy consumption of an appliance increases with door openings, which is directly related to the number of people in the household. Therefore, an adjustment of 1.12 was applied to the annual consumption of old refrigerators to account for the average number of people per participating household<sup>9</sup>. This adjustment is based on

<sup>7</sup> California climate zones 1 through 8 and 16.

<sup>8</sup> CADMUS et al., Residential Retrofit High Impact Measure Evaluation Report, p. 141, February 8, 2010.

<sup>9</sup> According to the participant survey, the average number of people per participating household is approximately 2.5, which is consistent with the results of the 2011 socket study.



the occupant adjustment factor proposed in the New York protocol metering<sup>10</sup> on which the metering study was based.

## Unitary Savings Value Calculation

Econoler calculated the unitary savings value related to the three refrigerator categories. The table below presents the variables that were used to calculate the unitary savings value. Starting with the average annual consumption value estimated for the refrigerators retired, the calculation accounts for the occupant adjustment factor, replacement equipment, partial use factors and the lab-to-on-site factor.

**Table 38: Unitary Savings Values for Retired Refrigerators**

| Refrigerator Category                           | Primary – Replaced  | Secondary – Replaced | Secondary – Not Replaced |
|-------------------------------------------------|---------------------|----------------------|--------------------------|
| Average Consumption – Unit Retired (kWh/yr)     | 1,226               | 1,226                | 1,226                    |
| Occupant Adjustment Factor                      | 1.12                | 1.12                 | 1.12                     |
| Replacement with a New Unit (%)                 | 67%                 | 67%                  | -                        |
| Average Consumption – New Replacement (kWh/yr)  | 384                 | 384                  | -                        |
| Replacement with a Used Unit (%)                | 33%                 | 33%                  | -                        |
| Average Consumption – Used Replacement (kWh/yr) | 487                 | 487                  | -                        |
| Lab-to-on-Site Factor                           | 0.82                | 0.82                 | -                        |
| Partial Use factor                              | 1.00                | 0.85                 | 0.74                     |
| Unitary Savings Value per Category (kWh/yr)     | 1,030               | 876                  | 1,016                    |
| <b>Proportion (%)</b>                           | <b>42%</b>          | <b>13%</b>           | <b>45%</b>               |
| <b>Average Unitary Savings Value</b>            | <b>1,004 kWh/yr</b> |                      |                          |

<sup>10</sup> New York Department of Public Service, Technical Resource Manual for Multifamily Replacement Refrigerators, September 29, 2010.

The equation below displays an example of the unitary savings calculation for primary – replaced refrigerators.

$$\{(1,226 \text{ kWh} \times 1.12) - [(67\% \times 384 \text{ kWh}) + (33\% \times 487 \text{ kWh})] \times 0.82\} \times 1.00 = 1,030 \text{ kWh/yr}$$

Similar calculations were made for the other refrigerator categories. Using the proportion of each category resulting from the participant survey, the average unitary savings value for refrigerators is estimated at 1,004 kWh per year.

#### 4.2.2 Freezers

Based on the same approach, Econoler reviewed the savings estimates of the freezers retired through the program. To do so, the following parameters were taken into consideration:

- > average consumption of freezers retired through the program (based on metering data);
- > percentage of freezers replaced after retirement;
- > replacement type (replaced by a new or used unit);
- > partial use factor; and
- > lab-to-on-site factor.

#### Average Consumption of Retired Freezers

To establish the annual consumption of the freezers retired through the program, Econoler used the data from the metering activity. In total, the annual energy consumption of 46 freezers was tested during this activity.

In order to estimate an average consumption representative of the freezers retired through the program, the annual energy consumption measured for the 46 freezers was analyzed per cubic foot and manufacture year. The table below presents the details of this analysis:

**Table 39: Average Metered Consumption Values for Retired Freezers**

| Manufacture Year                  | Average Annual Consumption per Cubic Foot (kWh/cu ft) | Proportion of Freezers in the Tracking Sheet (%) |
|-----------------------------------|-------------------------------------------------------|--------------------------------------------------|
| From ... to 1984                  | 86.2                                                  | 62%                                              |
| From 1985 to 1994                 | 80.5                                                  | 32%                                              |
| From 1995 to ...                  | 56.0                                                  | 6%                                               |
| <b>Average Annual Consumption</b> | <b>82.6 kWh/cu ft</b>                                 |                                                  |

Based on the manufacture year of the retired freezers monitored in the 2011 tracking sheet, these average values were weighted to establish an average consumption value of 82.6 kWh per cubic foot.

The average size of the retired freezers monitored in the tracking sheet corresponds to 13.6 cubic feet. Based on this average value, Econoler estimated the average consumption of retired freezers at 1,123 kWh/year.

$$\text{Average Consumption} = 82.6 \frac{\text{kWh}}{\text{cu ft}} \times 13.6 \text{ cu ft} = 1,123 \text{ kWh}$$

This average annual consumption will be used in the unitary savings calculations for the freezers retired through the program.

As with refrigerators, no degradation factor will be applied to the average consumption value calculated for retired freezers. The metering data already take into account the degradation of these appliances over time.

## **Replacement Ratio**

All freezers retired through the program are considered to be secondary units. After their retirement, these freezers can be replaced or not, which changes the unitary savings value generated by the retirement. In order to develop assumptions that are as accurate as possible, Econoler analyzed the freezers that were replaced and not replaced separately.

The participant survey was used to establish the replacement ratio of retired freezers. As mentioned in Section 3.7.4, of the participants who had retired their old freezers through the program, 58 percent replaced them. This replacement ratio will be used in the unitary savings calculations.

## **Average Consumption of Replacement Freezers**

According to the participant survey, when freezers were replaced, 82 percent were replaced with a new freezer and 18 percent with a used model.

The same approach as with refrigerators was used in this evaluation to estimate the consumption of both new and used replacement freezers. Participant survey results revealed that, among respondents who had replaced their freezers, 87 percent selected ENERGY STAR-qualified models. In that case, the average energy consumption of new freezers was estimated at 353 kWh, based on the value calculated for the ARep program using the manufacturer-reported energy consumption of ENERGY

STAR products<sup>11</sup>. For the remaining 13 percent that were not replaced with ENERGY STAR-qualified models, Econoler used the assumption that these replacement freezers had an average energy consumption equivalent to 2008 annual energy consumption estimates from Natural Resources Canada<sup>12</sup> (375 kWh per year). Finally, as for refrigerators, used replacement freezers were assumed to have an average energy consumption equivalent to 2003 annual energy consumption estimates from Natural Resources Canada, corresponding to 369 kWh per year.

**Table 40: Annual Energy Consumption Estimates for Replacement Freezers**

| Replacement Category | New ENERGY STAR | New Standard Model | Used       |
|----------------------|-----------------|--------------------|------------|
| Source               | ENERGY STAR     | 2008 NRCan         | 2003 NRCan |
| Consumption (kWh/yr) | 353             | 375                | 369        |

By applying the percentages of refrigerators replaced by ENERGY STAR models and standard models, the average energy consumption for new refrigerators is equal to the equation shown below.

$$\text{Average Energy Consumption} = (87\% \times 353 \text{ kWh/yr}) + (13\% \times 375 \text{ kWh/yr}) = 356 \text{ kWh/yr}$$

## Partial Use Factors

Secondary freezers are likely to be unplugged for a portion of the year. Therefore, partial use factors were developed to adjust the unitary savings calculations in accordance with the fact that not all freezers are operating year-round.

The participant survey was used to estimate the amount of time during which participants had their freezers plugged in year-round prior to retirement. Based on results from Table 13 Amount of Time Appliance was Plugged In (presented in Section 3.7.3), Econoler used the same plug-in patterns developed in the 2010 evaluation:

- > all the time – the freezer was plugged in for the entire year;
- > most of the time – the freezer was plugged in for nine months of the year;
- > occasionally – the freezer was plugged in for four months of the year;
- > never – the freezer was never plugged in during the year.

<sup>11</sup> ENERGY STAR, Freezers Qualified Product List, [www.energystar.gov](http://www.energystar.gov), list posted on January 17, 2012.

<sup>12</sup> Natural Resources Canada, Energy Consumption of Major Household Appliances Shipped in Canada, Trends from 1990-2008, p.71.

Using the equation below, the partial use factors were calculated for secondary freezers replaced and not replaced.

$$\% = \left( \frac{12}{12} \times \% \text{ All the time} \right) + \left( \frac{9}{12} \times \% \text{ Most of the time} \right) + \left( \frac{4}{12} \times \% \text{ Occasionally} \right) + \left( \frac{0}{12} \times \% \text{ Never} \right)$$

The table below displays the partial use factor calculated for secondary freezers.

**Table 41: Partial Use Factor for Retired Freezers**

| Freezer Category          | Secondary – Replaced and Not Replaced |
|---------------------------|---------------------------------------|
| <i>Sample Size</i>        | 39                                    |
| All the Time              | 35                                    |
| Most of the Time          | 1                                     |
| Occasionally              | 2                                     |
| Never                     | 1                                     |
| <b>Partial Use Factor</b> | <b>0.93</b>                           |

### Lab-to-on-Site Factor

As with refrigerators, a lab-to-on-site factor must be applied to the consumption values estimated for replacement freezers. The same lab-to-on-site factor of 0.82 is used for freezers.

For the retired freezers, no lab-to-on-site factor was applied to the annual consumption established from the metering data. As with refrigerators, an adjustment of 1.12 was applied to the metered consumption of old freezers to account for the average number of people per participating household.

## Unitary Savings Value Calculation

Econoler calculated the unitary savings value for the two freezer categories.

The table below presents the variables that were used to calculate the unitary savings value. Starting with the average annual consumption value estimated for the freezers retired, the calculation accounts for replacement equipment, partial use factors and the lab-to-on-site factor.

**Table 42: Unitary Savings Values for Retired Freezers**

| Freezer Category                                | Secondary – Replaced  | Secondary – Not Replaced |
|-------------------------------------------------|-----------------------|--------------------------|
| Average Consumption – Unit Retired (kWh/yr)     | 1,223                 | 1,223                    |
| Occupant Adjustment Factor                      | 1.12                  | 1.12                     |
| Replacement with a New Unit (%)                 | 82%                   | -                        |
| Average Consumption – New Replacement (kWh/yr)  | 356                   | -                        |
| Replacement with a Used Unit (%)                | 18%                   | -                        |
| Average Consumption – Used Replacement (kWh/yr) | 369                   | -                        |
| Lab-to-on-Site Factor                           | 0.82                  | -                        |
| Partial Use Factor                              | 0.93                  | 0.93                     |
| Unitary Savings Value per Category (kWh/yr)     | 1,001                 | 1,274                    |
| <b>Proportion (%)</b>                           | <b>57.5%</b>          | <b>42.5%</b>             |
| <b>Average Unitary Savings Value</b>            | <b>1,117 kWh/year</b> |                          |

The equation below displays an example of the unitary savings calculation for secondary – replaced freezers.

$$\{(1,223 \text{ kWh} \times 1.12) - [(82\% \times 423 \text{ kWh}) + (18\% \times 476 \text{ kWh}) \times 0.82]\} \times 0.93 = 1,001 \text{ kWh/yr}$$

A similar calculation was made for secondary – not replaced – freezers. Using the proportion of each category resulting from the participant survey, the average unitary savings value for freezers is estimated at 1,117 kWh per year.

### **4.2.3 Dehumidifiers**

Based on the deemed savings value estimated for ENERGY STAR-qualified dehumidifiers by the Wisconsin's Focus on Energy program<sup>13</sup>, the 2010 evaluation estimated a unitary savings value of 108 kWh for dehumidifiers retired through the ARet program. This unitary savings value was obtained by subtracting the new ENERGY STAR-qualified dehumidifier consumption, estimated at 627 kWh, from the old one, corresponding to 735 kWh.

For this year's evaluation, Econoler based its review on the evaluation of the Ontario Power Authority's (OPA) 2008 Every Kilowatt Counts program<sup>14</sup>. Initially, Econoler planned to use the data from the metering activity conducted at the recycling facility. However, more than 40 percent of the annual energy consumption calculated from the 29 dehumidifiers metered seemed to be underestimated as they were under the average annual consumption of new ENERGY STAR units. The Evaluator thinks that such low consumption may be due to the fact that the metering was made under conditions different from those encountered in homes when using their dehumidifier. Moreover, the capacity of the metered dehumidifiers was rarely available, which complicated the analysis.

### **Average Consumption of Retired Dehumidifiers**

The evaluation team of the OPA's 2008 Every Kilowatt Counts program conducted an on-site metering study in 36 Ontarian homes that were operating older dehumidifiers. The study revealed that the average capacity of old dehumidifiers was 17.4 litres per day (37 pints/day) and that the average energy factor (EF) was 0.99 litres per kWh. However, for this evaluation, the EF of 0.99 was adjusted to 0.66 according to the EF of actual units recycled through the program, as determined through laboratory testing. This difference in EF indicates that the dehumidifiers recycled through the ARet program were likely older and more degraded than the units metered through the in situ activity of the OPA.

Hours of operation of 1,114 hours per year (70 working days and a duty factor of 0.66) were used in the calculation. This annual usage of residential dehumidifiers in Nova Scotia was estimated by ENSC, using temperature and relative humidity data. Econoler validated the 1,114 hours value by consulting other studies from regions with similar meteorological data:

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<sup>13</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.

<sup>14</sup> The Cadmus Group, Evaluation of the Ontario Power Authority's 2008 Every Kilowatt Counts Power Savings Event, Keep Cool Pilot and Rewards for Recycling Programs, Final Report, Prepared for the Ontario Power Authority, July 9, 2009.

- > the Wisconsin Focus on Energy Evaluation calculated 921 hours per year<sup>15</sup>;
- > Efficiency Vermont uses 1,551 hours per year<sup>16</sup>;
- > ENERGY STAR uses 1,620 hours per year<sup>17</sup>.

The state of Wisconsin represents meteorological data that are the closest to Nova Scotia's weather conditions. However, the relative humidity level in Nova Scotia is, on average, slightly higher than that. As a result, Econoler considered adequate to use the annual figure of 1,114 hours estimated by ENSC, which was slightly above the 921 hours per year used by the Wisconsin Focus on Energy program.

Using these parameters, the calculations resulted in an average annual consumption of 1,224 kWh for old dehumidifiers retired:

$$\text{Consumption of Old Dehumidifiers} = \frac{17.4 \text{ liters/day}}{0.66 \text{ liter/kWh}} \times \frac{1,114 \text{ hours/year}}{24 \text{ hours/day}} = 1,224 \text{ kWh/year}$$

## Replacement Ratio

The dehumidifiers retired through the program can be subsequently replaced or not, which changes the unitary savings value attributable to the retirement. In order to take into account the actions taken afterwards by the participant, Econoler established a replacement ratio to calculate the unitary savings value of dehumidifiers that were replaced and not replaced separately.

The participant survey was used to establish this replacement ratio. As mentioned in Section 3.7.4, from the 11 participants who had retired their old dehumidifiers through the program and were able to indicate their replacement intentions, 7 (64%) replaced them.

Econoler is aware that this replacement ratio is established from a small sampling size. In spite of that, the survey results give a good indication that the replacement ratio is far from last year's estimation where it was assumed to be 100 percent. Therefore, Econoler considered it more appropriate to use the survey results to establish the replacement ratio than using the assumption that all dehumidifiers are ultimately replaced.

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<sup>15</sup> Wisconsin Focus on Energy, Dehumidifiers Deemed Savings Review for Targeted Home Performance with ENERGY STAR, Evaluation, March 19, 2009.

<sup>16</sup> Efficiency Vermont, Technical Reference User Manual (TRM), p. 305, 12/30/2008.

<sup>17</sup> ENERGY STAR, Dehumidifier energy savings calculator, [www.energystar.gov](http://www.energystar.gov), assumption from EPA 2006.



## Average Consumption of Replacement Dehumidifiers

The 2010 evaluation report calculated the average annual consumption of replacement dehumidifiers based on the assumption that the dehumidifiers retired were replaced by new ENERGY STAR-qualified units. For this year's evaluation, Econoler used a similar assumption since the participant survey revealed that the six out of seven participants who had replaced their dehumidifiers replaced them with new ENERGY STAR-qualified units (Table 18). This was confirmed by the on-site visits. Both participants visited had retired a dehumidifier under the program and replaced it with a new ENERGY STAR-qualified unit.

Therefore, based on ENERGY STAR eligibility criteria<sup>18</sup>, Econoler estimated that the EF of an ENERGY STAR dehumidifier unit with a capacity of 17.4 litres per day corresponded to 1.50. Using the same annual figure of 1,114 hours, the average consumption of replacement dehumidifiers is estimated at 538 kWh per year, as shown below.

$$\text{Consumption of New ES Dehumidifiers} = \frac{17.4 \text{ liters/day}}{1.50 \text{ liter/kWh}} \times \frac{1,114 \text{ hours/year}}{24 \text{ hours/day}} = 538 \text{ kWh/year}$$

## Unitary Savings Value Calculation

Econoler calculated the unitary savings value for both categories of dehumidifiers (replaced and not replaced). Starting with the average annual consumption value estimated for the dehumidifiers retired, the calculation accounts for the proportion of units replaced with a new dehumidifier.

The table below presents the variables that were used to calculate the unitary savings values for both categories of dehumidifiers and then to estimate an average unitary savings value based on the proportion of each category of participants.

**Table 43: Unitary Savings Values for Retired Dehumidifiers**

| Dehumidifier Category                          | Replaced          | Not Replaced |
|------------------------------------------------|-------------------|--------------|
| Average Consumption – Unit Retired (kWh/yr)    | 1,224             | 1,224        |
| Average Consumption – New Replacement (kWh/yr) | 538               | -            |
| Unitary Savings Value per Category (kWh/yr)    | 686               | 1,224        |
| Replacement Ratio (%)                          | 64%               | 36%          |
| <b>Average Unitary Savings Value</b>           | <b>880 kWh/yr</b> |              |

<sup>18</sup> ENERGY STAR, Program Requirements for Dehumidifiers – Eligibility Criteria – version 3.0, <http://www.energystar.gov/specifications>.

Therefore, the average unitary savings value for dehumidifiers was estimated at 880 kWh per year.

#### 4.2.4 Room Air Conditioner Units

Room air conditioner units were added this year to the ARet program. This appliance was included in the metering activity conducted at the recycling activity. In total, 12 units were metered over a two-hour period. However, Econoler did not use the energy consumption data from the metering study for this year's evaluation. As for dehumidifiers, the results of the metering study for room air conditioner units appeared to have been distorted. As a result, Econoler estimated the unitary savings value for room air conditioners using the evaluation results from a similar program: the OPA's Every Kilowatt Counts program.<sup>19</sup>

#### Average Consumption of Retired Room Air Conditioner Units

Based on the evaluation of the OPA's 2008 Every Kilowatt Counts program, Econoler calculated the average annual consumption of retired room air conditioner units using an average capacity of 8,000 Btu/h and an annual usage of 310.6 hours. These assumptions were based on the data collected during on-site metering conducted in 18 Ontarian houses operating older room air conditioners. To establish the energy efficiency ratio (EER) of the recycled units, the OPA's evaluation team calculated the average EER of 15 room air conditioners recycled through the program using the ratios determined through the laboratory testing. The EER value of the retired room air conditioner units was estimated at 6.69 Btu/W-h.

Using these parameters, the calculations resulted in an average annual consumption of 371 kWh for old room air conditioners retired, as shown below.

$$\text{Consumption of Old AC unit} = \frac{8,000 \text{ Btu/hr}}{6.69 \frac{\text{Btu}}{\text{W} \cdot \text{hr}} \times \frac{1,000 \text{ W}}{\text{kW}}} \times 310.6 \frac{\text{hr}}{\text{year}} = 371 \text{ kWh}$$

#### Replacement Ratio

The unitary savings value resulting from the retirement of old room air conditioner units varies depending on participants' decision to replace their appliance or not. For the other appliances retired through the program, the replacement ratios were established from the participant survey. However, since the number of participants for room air conditioners was small in comparison with other appliances, they were not included in the survey.

<sup>19</sup> The Cadmus Group, Evaluation of the Ontario Power Authority's 2008 Every Kilowatt Counts Power Savings Event, Keep Cool Pilot and Rewards for Recycling Programs, Final Report, Prepared for the Ontario Power Authority, July 9, 2009.

To establish the replacement ratio of the room air conditioners retired through the program, Econoler used the information from the participant declaration at the time of retiring their old room air conditioners. In total, 80 percent of the participants who had retired their room air conditioner indicated whether they were going to replace their unit. The majority (75%) of respondents intended to ultimately replace their room air conditioner units. Therefore, Econoler used that 75 percent value in the unitary savings calculation for the room air conditioner units retired through the program.

### **Average Consumption of Replacement Room Air Conditioner Units**

For this evaluation, Econoler assumed that the room air conditioner units retired are replaced by new ENERGY STAR-qualified units.

For the new ENERGY STAR-qualified units, Econoler used the following parameters, also based on the evaluation of the OPA's 2008 Every Kilowatt Counts program:

- > an EER value of 10.7 Btu/W-h, which corresponded to an average EER for ENERGY STAR units of a size comparable to what was retired;
- > a capacity of 8,000 Btu/h; and
- > hours of operation totalling 310.6 hours per year.

Therefore, the average annual consumption for a new ENERGY STAR-qualified unit purchased in Nova Scotia was estimated at 232 kWh.

$$\text{Consumption of ENERGY STAR AC Unit} = \frac{8,000 \text{ BTU/hr}}{10.7 \frac{\text{BTU}}{\text{W} \cdot \text{hr}} \times \frac{1,000 \text{ W}}{\text{kW}}} \times 310.6 \text{ h} = 232 \text{ kWh/year}$$

## Unitary Savings Value Calculation

Econoler calculated the unitary savings value for both categories of room air conditioners (replaced and not replaced). Starting with the average annual consumption value estimated for units retired, the calculation accounted for the proportion of units replaced with a new room air conditioner. The table below presents the variables that were used to calculate the average unitary savings value for room air conditioners based on the proportion of each category of participants.

**Table 44: Unitary Savings Value for Retired Room Air Conditioner Units**

| Room Air Conditioner Unit                      | Replaced          | Not Replaced |
|------------------------------------------------|-------------------|--------------|
| Average Consumption – Unit Retired (kWh/yr)    | 371               | 371          |
| Average Consumption – New Replacement (kWh/yr) | 232               | -            |
| Unitary Savings Value per Category (kWh/yr)    | 139               | 371          |
| Replacement Ratio (%)                          | 75%               | 25%          |
| <b>Average Unitary Savings Value</b>           | <b>197 kWh/yr</b> |              |

Therefore, the average unitary savings value for room air conditioners was estimated at 197 kWh per year.

Econoler considers that this result can be used for estimating the energy savings from the room air conditioners retired in Nova Scotia since it is derived from a metering activity conducted for a reliable organization. Even if the summer temperature is slightly cooler in Nova Scotia than it is in Ontario, Econoler considers that the annual usage estimated by the OPA is adequate.

### 4.2.5 Energy-to-Demand Ratio

Econoler calculated the demand savings for the ARet program based on an energy-to-demand ratio of 6.27 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings by the target peak demand savings.

## 4.2.6 Revised Gross Savings

Gross energy savings for the program were revised to include the average unitary savings values estimated for all types of appliances retired through the program. These adjusted unitary savings values take into account the proportion of primary and secondary units, the proportion of units replaced and not replaced, the replacement type (with new or used units), partial use factors and lab-to-on-site factors. Using the energy-to-demand ratio of 6.27 GWh/MW, the demand savings were also revised.

Gross energy and demand savings resulting from the retirement of old appliances through the ARet program are presented in the table below. The gross savings calculation also includes the savings from additional units retired through the in-store weekend events conducted under the framework of the Efficient Products – Retail Markdown Program. Finally, since there was only one appliance retired through the Efficient Products - Multi-Unit Residential Renter pilot program, the unit was also claimed in this evaluation.

Overall, total gross energy and demand savings amount to 8.163 GWh and 1.302 MW at the meter. At the generator, energy and demand savings are estimated at 9.020 GWh and 1.439 MW, using a line loss factor of 1.1050 estimated for the residential sector. This value was provided by Nova Scotia Power.

**Table 45: Evaluation Results – Gross Energy and Demand Savings**

|                                                        | Refrigerators | Freezers     | Dehumidifiers | Room AC Units |
|--------------------------------------------------------|---------------|--------------|---------------|---------------|
| <b>Energy Savings</b>                                  |               |              |               |               |
| Number of Units Retired – Aret Program                 | 4,280         | 2,593        | 813           | 225           |
| Number of Units Retired – RMP In-Store Events          | -             | -            | 220           | 79            |
| Number of Units Retired – MURR Program                 | -             | -            | 1             | -             |
| Total Number of Units Retired                          | 4,280         | 2,593        | 1,034         | 304           |
| Unitary Savings (kWh)                                  | 1,004         | 1,117        | 880           | 197           |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>4.297</b>  | <b>2.896</b> | <b>0.910</b>  | <b>0.060</b>  |
| Line Loss Factor                                       | 1.1050        | 1.1050       | 1.1050        | 1.1050        |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>4.748</b>  | <b>3.201</b> | <b>1.005</b>  | <b>0.066</b>  |
| <b>Demand Savings</b>                                  |               |              |               |               |
| Energy-to-Demand Ratio                                 | 6.27          | 6.27         | 6.27          | 6.27          |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.685</b>  | <b>0.462</b> | <b>0.145</b>  | <b>0.010</b>  |
| Line Loss Factor                                       | 1.1050        | 1.1050       | 1.1050        | 1.1050        |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.757</b>  | <b>0.510</b> | <b>0.160</b>  | <b>0.011</b>  |

### 4.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the installation of an energy-efficient product has an impact on the energy consumption of other elements such as heating and cooling. In the case of the ARet program, retirement of old appliances causes an increase in the heating load during winter and a decrease in the cooling load during summer since the compressor of the old appliance released heat. Interactive effects still occur when the retired appliance is replaced as a more energy-efficient appliance releases less heat than the less efficient unit it replaces.

In Nova Scotia, the heating load period lasts around eight months while the cooling load period is relatively short<sup>20</sup>. Hence, the interactive effects due to the retirement or replacement of an old appliance are expected to be negative, influencing downward the savings generated by such replacement. However, considering the various factors that affect interactive effects, Econoler concludes that the interactive effects for the ARet program are insignificant. Indeed, Econoler took into account the following factors in its analysis:

- > As part of this evaluation, the focus is on electricity savings. Hence, the negative interactive effects on the heating load only affect 33 percent of the households, which represents the percentage of households using electricity as their primary heating source in Nova Scotia<sup>21</sup>.
- > In Nova Scotia, 18 percent of households have air conditioning. During the cooling period, interactive effects are positive in these households.
- > Several appliances, such as refrigerators and freezers, retired through the program are built-in or leaned against an exterior wall, which reduces the interactive effects generated by the retirement.

Due to these elements, the interactive effects factor for the ARet program is assumed to be null.

### 4.4 NET-TO-GROSS RATIO

The net-to-gross ratio (NTGR) is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on customers' decision to participate in the program. This section presents the methodology used to transform information obtained through the participant survey into a NTGR. For the ARet program, the NTGR includes the assessment of two distortion effects: free-ridership and spillover. Once each effect is quantified, the NTGR is calculated based on the equation below:

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ spillover})$$

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<sup>20</sup> RETScreen, Climatic Data for Halifax International Airport.

<sup>21</sup> From the socket study conducted by CRA with 1,004 households of Nova Scotia.

## Free-Ridership

The free-ridership level was measured using the participant survey. The questionnaire included six free-ridership questions that attempted to assess:

- > if the participants had already considered disposing of their appliance before learning about the program;
- > what alternative ways the participants would have considered to dispose of their old appliance if the program had not been in place;
- > the probability that the participants would have retired their old appliance but at a later date if they had not participated in the program;
- > the influence of the program on the participants' decision to retire their old appliances;
- > if the participants would have paid the full cost of recycling their old appliance themselves if the program had not been in place; and
- > the amount that the participants would have been willing to pay someone to recycle their old appliance.

Questions were asked separately for refrigerators, freezers and dehumidifiers. Room air conditioners were not included in the survey because of the small number of participants for this appliance compared to the three other appliances. Since that type of appliance was new in the program in 2011, its free-ridership level was assumed to be null.

Each question was transposed into a level of program attribution which was used to calculate the level of free-ridership for each participant. The algorithm behind this calculation is presented in Appendix VIII.

As presented in the table below, a free-ridership level was estimated for each category of appliances and then transposed into an average free-ridership level based on the proportion of energy savings generated by each category of appliances in 2011.

**Table 46: Free-Ridership Calculation**

| Room Air Conditioner Units          | Refrigerators | Freezers | Dehumidifiers | Room AC Unit |
|-------------------------------------|---------------|----------|---------------|--------------|
| Free-Ridership Level per Category   | 20%           | 26%      | 21%           | 0%           |
| Proportion of Gross Savings         | 53%           | 35%      | 11%           | 1%           |
| <b>Average Free-Ridership Level</b> | <b>22%</b>    |          |               |              |

The average level of free-ridership of 22 percent can be directly applied to the total gross savings of the program since it already considers the weight of each appliance in terms of energy savings. For

the appliances retired through the in-store weekend events conducted during retail markdown campaigns, a free-ridership level of 0 percent will be used.

The approach used by Econoler was consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania. More particularly, it incorporates questions to jointly consider and rate the importance of the many likely factors that may have influenced customer energy efficiency decision making. This question structure more accurately reflects the complex nature of real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

### **Internal Spillover**

The internal spillover effects of the program are measured through the participant survey. Internal spillover can occur when participants decide to retire or replace other appliances on their own following their previous participation in the program and due to its influence.

During the telephone survey, participants were asked if they had retired additional appliances following their previous participation in the program. A question was used to verify the eligibility of the additional retirements by asking how they disposed of the old appliances.

Subsequently, another question was asked to verify the influence of the program on participants' decisions to dispose of additional appliances without receiving a rebate. Depending on the level of influence obtained during the survey, a portion of the savings related to the additional retirements was attributed to the program.

The level of internal spillover was calculated for each participant according to the equation below. The energy savings (kWh) associated with the additional retirements were estimated using the adjusted unitary savings value reviewed in this evaluation for each type of appliances.

$$\%SO = \frac{kWh \text{ associated with the additional retirement} \times \text{attribution level}}{kWh \text{ associated with the appliances retired through the program}}$$

From the 90 participants surveyed, two declared having retired one additional appliance following their previous participation in the program. These participants estimated that the program had had an average influence of 60 percent on their action. The total savings resulting from these additional retirements multiplied by the attribution level amounted to 788 kWh. Divided by the energy savings generated by the participants who had answered the survey, it corresponded to an internal spillover level of 1 percent.

Using the free-ridership and spillover levels established, the NTGR value for the program is shown below.

$$NTGR = (1 - \% \text{ free-ridership} + \% \text{ spillover}) = (1 - 22\% + 1\%) = 0.79$$



## 4.5 NET SAVINGS

The net energy savings are estimated by adding the interactive effects and the NTGR to the gross savings, based on the equation below.

$$\text{Net Energy Savings} = \text{Gross Energy Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

Overall, total net energy and demand savings amount to 6.493 GWh and 1.036 MW at the meter, and 7.175 GWh and 1.144 MW at the generator.

**Table 47: Evaluation Results – Net Energy and Demand Savings**

|                            | Energy Savings (GWh) |                  | Demand Savings (MW) |                  |
|----------------------------|----------------------|------------------|---------------------|------------------|
|                            | At the Meter         | At the Generator | At the Meter        | At the Generator |
| <b>Total Gross Savings</b> | <b>8.163</b>         | <b>9.020</b>     | <b>1.302</b>        | <b>1.439</b>     |
| Interactive Effects Factor | 0%                   | 0%               | 0%                  | 0%               |
| NTGR*                      | 0.79                 | 0.79             | 0.79                | 0.79             |
| <b>Total Net Savings</b>   | <b>6.493</b>         | <b>7.175</b>     | <b>1.036</b>        | <b>1.144</b>     |

\* A NTGR of 1 was used for the appliances retired through the RMP in-store events.

As shown below, the demand and energy savings resulting from this evaluation were compared to the savings from the 2011 tracking sheet.

**Table 48: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | NTGR         | Net Savings      |
|---------------------------|-----------------------|--------------|------------------|
| <b>Energy Savings</b>     |                       |              |                  |
| Tracked Savings from ENSC | 5.661 GWh             | 0.74         | 4.189 GWh        |
| <b>Evaluation Results</b> | <b>9.020 GWh</b>      | <b>0.80*</b> | <b>7.175 GWh</b> |
| <b>Demand Savings</b>     |                       |              |                  |
| Tracked Savings from ENSC | 0.903 MW              | 0.74         | 0.668 MW         |
| <b>Evaluation Results</b> | <b>1.439 MW</b>       | <b>0.80*</b> | <b>1.144 MW</b>  |

\* A NTGR of 0.79 was used for appliances retired through the ARet program and of 1 for appliances retired through the RMP in-store weekend events.

The evaluated net savings exceeded those tracked by ENSC by 71 percent. This result was mainly due to the revision of the unitary savings values for each type of appliances. For refrigerators and freezers, the review was based on metering data, which allowed taking into account the actual condition of the old appliances retired and their degradation over time. For the next evaluation, Econoler recommends pursuing this approach by metering the energy consumption of a representative sample of refrigerators and freezers retired during the year. Thus, it is no longer necessary to ask the recycler to collect the theoretical energy consumptions of the appliances in the tracking sheet but it remains important to monitor the size and the age of the appliances retired, which are two parameters used in the unitary savings calculation.

For dehumidifiers and room air conditioners, Econoler used the results from a metering study conducted in Ontario for the evaluation of the Every Kilowatt Counts program. The results of the dehumidifier and air conditioner metering activity conducted at the recycling facility could not be used. Econoler suspected that the conditions were not representative of those found in homes when these appliances are in function, typically during the summer. Therefore, ENSC could consider doing on-site metering during the summer in homes that operate old dehumidifiers and room air conditioners and have manifested the desire to retire their old appliances. Moreover, when conducting such activity, it is important to collect information on the model, such as the capacity and the age of manufacture, and information on usage patterns by asking the participants during which seasons they operate their appliances and for how long.

The NTGR was evaluated at 0.79 for the appliances retired through the program, and at 1 for the appliances retired through the RMP in-store events. The NTGR of 0.79 was slightly higher than what was used in the tracking sheet (0.74). Econoler used a different approach this year to assess the free-ridership level and included questions in the survey to validate the presence of internal spillover, which was estimated at 1 percent.

Finally, the interactive effects factor remained the same as in the tracking sheet. Econoler evaluated these potential effects on the heating and cooling consumption of homes and concluded that they were negligible.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Provide a “base case”:</b> The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. For refrigerators and freezers, they are calculated on a case-by-case basis, using the real consumption of the appliance(s), as provided by EnerGuide databases or others. For dehumidifiers and air conditioner units, the algorithm uses a base consumption value. The methodology and the databases used to identify each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                        |
|                               | <b>2. Provide the parameters used to estimate the program objectives:</b> After having estimated the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. Moreover, the parameters should be continually adjusted based on the most recent evaluation results. |
|                               | <b>3. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. The plans should also identify for each activity the performance indicators that should be collected for monitoring and evaluation purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                               | <b>4. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing that would serve as “program memory” in case of modifications or staff changes. For instance, it is not mentioned that not only secondary units can be retired though the program but primary units as well, as detailed in the tracking sheet. The program manual content should be regularly updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.                                                                                            |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b>            | <p><b>5. Facilitate tracking of savings by using adjusted unitary savings values:</b> In 2011, a metering study was conducted as part of this evaluation. The results were used to estimate the unitary savings values for each type of appliances retired through the program according to various parameters such as the average size of the retired refrigerators, the occupant adjustment factor, the replacement ratio, the partial use factor and the lab-to-on-site factor. In the future, these unitary savings values should be used to monitor gross energy savings in the tracking sheet. Then, the values should be adjusted after each evaluation.</p> <p><b>6. Determine the required fields and remove unnecessary ones:</b> The PM together with the evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. Conversely, the fields that are not utilized should be removed from the tracking sheet in order to concentrate the efforts on the essential. For instance, the year of manufacture and the size in cubic feet of the old refrigerators and freezers retired were very useful to the Evaluator in order to estimate the average energy consumption of these appliances. For dehumidifiers and room air conditioners, such information was not available. It would be useful to have at least the capacity, in litres per day, for dehumidifiers and in Btu per hour for room air conditioners, which is a key determinant of energy consumption for those appliances. Information on the number of months the appliance is used could also be useful in order to estimate the partial use factor for refrigerators and freezers and the annual usage of dehumidifiers and air conditioners.</p> <p><b>7. Standardize the entries and fix limitations:</b> To avoid entering the same information in different ways, ENSC should integrate a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the number of data entry errors. For instance, in the 2011 tracking sheet, Econoler found six different ways of spelling “Halifax,” which complicated data coding for selecting the on-site visit sample. Additionally, a drop-down list will limit the choices of answers and allow rapidly identifying non-eligible products. Limitations could also be added to the system in order to indicate the fields that have to be filled depending on appliance type and prior entries. Finally, a quick validation process should be developed and applied to the tracking sheet to flag inconsistencies and missing entries.</p> |
| <b>Program Design and Implementation</b> | <p><b>8. Focus the marketing efforts on customers’ reluctance:</b> One of the main program barriers identified is the customers’ resistance to get rid of a working appliance. Econoler recommends that the marketing strategy be oriented towards that specific barrier.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Design and Implementation</b> | <p><b>9. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Relationship with Partners</b>        | <p><b>10. Strengthen the marketing strategy:</b> The delivery agent expressed a lower level of satisfaction with the program outreach and marketing activities. The participant survey results also show that 13 percent of respondents recommended that the program be better advertised.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Participant Perspectives</b>          | <p><b>11. Communicate the information related to appliance disposal:</b> A majority of participants know that appliances retired through the program are recycled. However, the program should communicate the information related to appliance disposal since a significant proportion of participants still do not know about this program component.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Impact Evaluation</b>                 | <p><b>12. Pursue the metering of refrigerators and freezers at the recycling facility:</b> For refrigerators and freezers, the unitary savings calculation was based on metering data, which allowed taking into account the actual condition of the old appliances retired and their degradation over time. For the next evaluation, Econoler recommends pursuing this approach by metering the energy consumption of a representative sample of refrigerators and freezers retired during the year. Thus, it is no longer necessary to ask the recycler to collect the theoretical energy consumptions of the appliances in the tracking sheet but it remains important to monitor the size and the age of the appliances retired, which are two parameters used in the unitary savings calculation.</p> <p><b>13. Conduct on-site metering for dehumidifiers and room air conditioners:</b> The metering conducted at the recycling facility included the consumption measurement of 29 dehumidifiers and 12 room air conditioners retired through the program. However, the results obtained from this metering study could not be used in this evaluation. Econoler suspected that the environment conditions at the recycling facility were not representative of those found in homes when these appliances are in function, typically during the summer. Therefore, Econoler recommends considering on-site metering to be carried out next summer in homes that operate old dehumidifiers and room air conditioners and that have manifested their desire to retire their old appliances</p> |

## APPENDIX II - DEMOGRAPHICS

The majority of respondents live in a single-family detached home (87%), while a small number live in other types of homes such as semi-detached, apartment building, townhouse, or mobile home.

**Table 49: Type of Home**

| Type of home                                                   | 2010 | 2011 |
|----------------------------------------------------------------|------|------|
| <i>Sample Size</i>                                             | 70   | 90   |
| Single-family detached house                                   | 89%  | 87%  |
| Semi-detached house                                            | 1    | 6    |
| Apartment building that has fewer than 5 stories               | --   | 2    |
| Mobile home or house trailer                                   | --   | 2    |
| Single-family attached house (townhouse, row house, or duplex) | 6    | 1    |
| Apartment building that has 5 or more stories                  | --   | 1    |
| Apartment building with 2-4 units                              | 3    | --   |
| Apartment building with 5 or more units                        | 1    | --   |
| Other                                                          | --   | --   |
| Don't know/refused                                             | 1    | 1    |

The majority of respondents currently own their home.

**Table 50: Home Ownership**

| Home Ownership     | 2010 | 2011 |
|--------------------|------|------|
| <i>Sample Size</i> | 70   | 90   |
| Own                | 91%  | 90%  |
| Rent/lease         | 7    | 8    |
| Other              | 1    | 2    |
| Don't know/refused | --   | --   |

The majority of respondents are in homes with at least three bedrooms (79%).

**Table 51: Number of Bedrooms in Home**

| Number of Bedrooms | 2010 | 2011 |
|--------------------|------|------|
| <i>Sample Size</i> | 70   | 90   |
| 1                  | 1%   | 1%   |
| 2                  | 9    | 18   |
| 3                  | 57   | 43   |
| 4 or more          | 31   | 36   |
| Don't know/refused | 1    | 2    |

Just under one-half of respondents have a college or university degree (48%).

**Table 52: Highest Level of Education**

| Level of Education                                                    | 2010 | 2011 |
|-----------------------------------------------------------------------|------|------|
| <i>Sample Size</i>                                                    | 70   | 90   |
| Less than high school graduate certificate                            | 1%   | 10%  |
| High school graduate certificate and/or some post-secondary education | 23   | 28   |
| Trade certificate/diploma                                             | 9    | 6    |
| College certificate/diploma                                           | 19   | 14   |
| University certificate/diploma                                        | 44   | 34   |
| Don't know/refused                                                    | 4    | 8    |

The majority of respondents have one or two people in the household (67%).

**Table 53: Household Size**

| Household Size     | 2010 | 2011 |
|--------------------|------|------|
| <i>Sample Size</i> | 70   | 90   |
| 1                  | 11%  | 21%  |
| 2                  | 43   | 46   |
| 3                  | 20   | 14   |
| 4                  | 14   | 8    |
| 5                  | 4    | 4    |
| 6 or more          | 3    | 6    |
| Don't know/refused | 4    | 1    |

Over one-half of respondents are 55 years of age or older (58%).

**Table 54: Age of Respondent**

| Age of Respondent  | 2010 | 2011 |
|--------------------|------|------|
| <i>Sample Size</i> | 70   | 90   |
| 18 to 24           | 1%   | 0%   |
| 25 to 34           | 13   | 8    |
| 35 to 44           | 13   | 11   |
| 45 to 54           | 27   | 20   |
| 55 to 64           | 14   | 38   |
| 65 or over         | 27   | 20   |
| Don't know/refused | 4    | 3    |

Nearly all respondents pay the electric bill themselves (97%).

**Table 55: Method of Electric Bill Payment**

| You Pay Electric Bills | 2010 | 2011 |
|------------------------|------|------|
| <i>Sample Size</i>     | 70   | 90   |
| Yes                    | 97%  | 97%  |
| No                     | 1    | 2    |
| Don't know/refused     | 1    | 1    |

All respondents reside in their home year round.

**Table 56: Residency in Home**

| Residency in Home      | 2010 | 2011 |
|------------------------|------|------|
| <i>Sample Size</i>     | 70   | 90   |
| Year round residence   | 96%  | 100% |
| Seasonal/vacation home | 3    | --   |
| Don't know/ Refused    | 1    | --   |



Just over two in 10 respondents have an annual household income of \$80,000 or more.

**Table 57: Household Income**

| <b>Household Income</b> | <b>2010</b> | <b>2011</b> |
|-------------------------|-------------|-------------|
| <i>Sample Size</i>      | <i>70</i>   | <i>90</i>   |
| \$14,999 or less        | 1%          | 7%          |
| \$15,000 to \$24,999    | 4           | 8           |
| \$25,000 to \$34,999    | 9           | 14          |
| \$35,000 to \$49,999    | 13          | 13          |
| \$50,000 to \$69,999    | 14          | 8           |
| \$70,000 to \$79,999    | 7           | 4           |
| \$80,000 or more        | 24          | 23          |
| Don't know/refused      | 27          | 22          |

Six in 10 respondents are female (62%), while four in 10 are male (38%).

**Table 58: Gender**

| <b>Gender</b>      | <b>2010</b> | <b>2011</b> |
|--------------------|-------------|-------------|
| <i>Sample Size</i> | <i>70</i>   | <i>90</i>   |
| Female             | 56%         | 62%         |
| Male               | 44          | 38          |

## **APPENDIX III - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Retirement Program**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                               |
|-------------------------------|
| <b>Source: Program manual</b> |
|-------------------------------|

#### **Page 19**

Q: Is the recycle depot Ecosystem in Laval, Quebec? If yes is it cost effective? Is it your only option?

#### **Page 20**

Q: What is the role of the municipal electrical distributors in this program? (Last bullet)

#### **Page 21**

Q: your assumption is that the retired unit will not be replaced. If a unit subject to a discount replaces it, do you attribute the savings to the other program or calculate the net savings in this program?

Q: If it is replaced by another unit not part of any other of your program do you still calculate the savings as if it was not replaced?

C: Saturation - The cream skimming phenomena could easily apply to this program, and then the participation rate will slow down.

#### **Page 22**

Q: What do you intend to do about the degradation factor?

#### **Page 58**

C: In the logic model, the bullet containing the participants receive rebates should be in the short-term outcome section

|                       |
|-----------------------|
| <b>Source Website</b> |
|-----------------------|

C: The eligibility criteria to be 10 year old and more and in working condition are two good criteria.

Q: The self-declared formula to verify that they qualify for the program. Is there any cross checking done with the survey to validate such declaration?

C: The information on the Website concerning that program is complete and very useful.

**Page 4**

Q: Is EcoSolutions the same that EcoSystem? Based in Laval, Quebec.

|                                |
|--------------------------------|
| <b>Source: 2010 Evaluation</b> |
|--------------------------------|

**Page 1**

Is this program now separate from the replacement program? Before they use to be together?

**Page 2**

C: Market transformation could be hard to reach specially that it's a resource desacquisition and it's mostly a behavior aspect.

**Page 16**

Q: what is the status concerning relatively high free ridership levels?

Q: What is the status regarding the recommendation to screen the free-ridership?

C: Cream skimming could look like a lot of free riders.

**Page 51**

ARR-R12 Q: what is the status about this recommendation of too many organizations generating communication problems?

**Page 47**

ARR-R3 Q: to your knowledge is this still the case? It will be investigated by this year's survey

**Page 48**

ARR-R6 Q: What is the status of this recommendation about reducing the incentive?

C: It seems that on one hand the evaluator says there are too many organizations involved (generating communication problems) and on the other hand it was very easy to enroll in the program?

**Page 50**

ARR-R11

C: This recommendation seems very unrealistic? Care to comment?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Do you have the source and details for the gross savings you attribute to each of the appliances?

Q: Was there any distortion effects predicted for each unit and what where they?

Q: What are the main barriers that were identified to the retirement of these appliances?

Q: Do you perform post cost-effectiveness test after getting the results of the impact evaluation?

Q: Is there a process flow chart for that program? The web site explains all the steps but there is no illustration.

Q: was there an evaluation plan associated to that program when it was first designed?

Q: Nowhere do we see the role of the delivery company that picks-up the old units. We understand that their role is just pick-up and transport to the recycling site? Do they submit activities reports? Do you call them subcontractors? How many are they? Can you describe in summary what are their roles in the program so we can develop the appropriate question for the process interview with them.

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

|                |
|----------------|
| <b>General</b> |
|----------------|

Q: why did the program selected these 4 appliances? Refrigerator, Freezers, Dehumidifier, Refrigerators? Justification?

Q: Did the program design foresee any distortion effects (free-riders, spill-over, interactive effects, etc.) for some of the program products?

Q: what was the main barrier for customers to acquire these products (when you designed the program)?

Q: Do you perform a post-cost effectiveness test after each evaluation? And if not why?

Q: was there an evaluation plan when this program was first designed?

Q: Is there a written marketing and outreach strategy for that program with performance indicators?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

Thank you very much.

---

## **APPENDIX IV - INTERVIEW GUIDE WITH DELIVERY AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Appliance Retirement Program**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, save the file and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca)

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was the complaint about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**



**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Appliance Retirement Program**

**Q9 – We would like your opinion on the number of third parties involved in this program other than you (transport contractor, recycling contractor, call center).**

**Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a- If you answered Too Few or Too Many, please comment:**

**Q10 – In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes
- ☐ No

**Q10a – If you answered Yes to Q10, would you care to explain the nature of the confusion? And whether it was resolved or not.**

**Q11- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other program partners in this program?**

**Transport Contractor:**

**Score:**

**Recycler:**

**Score:**

**Call Center:**

**Score:**

**Q11a- If any of your answers to Q8 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q12 – Who provides you with leads for potential participants?**

**Q13- What is your opinion in regard to the program name that has changed from “Pull the Plug” to Appliance Retirement and Replacement Program (ARR) and to Appliance Retirement Program (ARet) since its first implementation?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name (new territory, additional equipment, etc.)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion

**Q15- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q15a- What was the complaint about?**

**Q16 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number with area code

E-mail

## **APPENDIX V - INTERVIEW GUIDE WITH CONTRACTORS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Appliance Retirement Program**

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**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was the complaint about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Appliance Retirement Program**

**Q9 – We would like your opinion on the number of third parties involved in this program other than you (delivery agent, transport contractor, call center).**

**Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a- If you answered Too Few or Too Many, please comment:**

**Q10 – In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes
- ☐ No

**Q10a – If you answered Yes to Q10, would you care to explain the nature of the confusion? And whether it was resolved or not.**

**Q11- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners in this program?**

**Delivery Agent:**

**Score:**

**Transport Contractor:**

**Score:**

**Call Center:**

**Score:**

**Q11a- If any of your answers to Q11 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q12 – Who provides you with leads for potential participants?**

**Q13- What is your opinion in regard to the program name that has changed since its first implementation (from “Pull the Plug” to Appliance Retirement and Replacement Program (ARR) to Appliance Retirement Program (ARet))?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name (new territory, additional equipment, etc.)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion



**Q15- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q15a- What was the complaint about?**

**Q16 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number with area code

E-mail

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## APPENDIX VI - PARTICIPANT SURVEY QUESTIONNAIRE

### Participant Survey

#### ENSC 2011 Appliance Retirement Program

Nov 2, 2011

#### SCREENING QUESTIONS

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your household recently participated in Efficiency Nova Scotia Corporation’s Appliance Retirement Program. We would appreciate your collaboration in answering questions related to your participation in this program.

We are calling customers who used the program to remove and recycle refrigerators, freezers or dehumidifiers in 2011. Are you the person who was most involved and familiar with deciding to have your old refrigerator, freezer or dehumidifier picked up and recycled through the program?

[IF NO, ASK TO SPEAK TO THE APPROPRIATE PERSON: “May I please speak to the person who knows the most about having the appliance picked up?”]

[IF APPROPRIATE PERSON] We are trying to get feedback from customers about the Appliance Retirement program to make the program better. Your responses will be kept strictly confidential—that is, your name will not be associated with any of your responses. This survey will take about 15 minutes of your time. Is this a good time for you?

[IF REFUSED, ASK “Can we schedule a more convenient time for you to conduct this survey?”]

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

In the past, the Appliance Retirement Program was known as “Pull the Plug”. Throughout the questionnaire, I will refer to it as the “Appliance Retirement Program”.

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

## Verification and Recall

V1. Our records indicate that your household participated in Efficiency Nova Scotia's Appliance Retirement Program, which removed and recycled

[INSERT NUMBER FROM VARIABLE "RF" IN THE SAMPLE] refrigerator(s),

[INSERT NUMBER FROM VARIABLE "FZ" IN THE SAMPLE] stand-alone freezer(s), (and)

[INSERT NUMBER FROM VARIABLE "DH" IN THE SAMPLE] dehumidifier(s)

from your home in 2011. Is this correct?

1. Yes [GO TO P1]
2. No, does not recall participating [PROBE: "Let me clarify. Someone would have come to your home and picked up your old appliance to recycle it. You would have received a \$10 or \$35 rebate also."] [IF PERSIST AS NO, THANK, TERMINATE AND RECORD]
3. No, different quantities (GO TO V2)
4. (Don't know) [PROBE: "Let me clarify. Someone would have come to your home and picked up your old appliance. You would have received a \$10 or \$35 rebate also."] IF PERSIST AS NO, THANK, TERMINATE AND RECORD.

V2. [ASK IF V1=3] Let me clarify, I am talking about the Efficiency Nova Scotia's Appliance Retirement program, which removed and recycled refrigerators, freezers or dehumidifiers from your home and paid you a \$10 or \$35 rebate for participating. This was not a program that gave any rebates for purchases of new or replacement refrigerators, freezers or dehumidifiers.

Thinking only about any appliances that were picked up through the Appliance Retirement program, which quantities are wrong? The .... [READ BELOW 1 = YES, 2 = NO, 98 = Don't Know]

- a. Number of refrigerators picked up
- b. Number of freezers picked up
- c. Number of dehumidifiers picked up

- V3. [IF V2a. = YES] How many refrigerators were picked up through the Appliance Retirement program? [Record number, 98=Don't Know, 99= Refused] \_\_\_\_\_
- V4. [IF V2b. = YES] How many stand-alone freezers were picked up through the Appliance Retirement Program? [Record number, 98=Don't Know, 99=Refused]\_\_\_\_\_
- V5. [IF V2c. = YES] How many dehumidifiers were picked up through the Appliance Retirement Program? [Record number, 98=Don't Know, 99=Refused]\_\_\_\_\_

## Program notoriety and Participation [P series]

- P1. How did you find out about this program? (DON'T READ; ALLOW MULTIPLE RESPONSE BUT DO NOT PROBE FOR MULTIPLE.)

### Program Administrator Sources

1. (Bill insert/mailling from Efficiency Nova Scotia)
2. (Efficiency Nova Scotia website)
3. (Advertising in newspaper, radio, TV)

### Retailer Sources

4. (Appliance retailer/dealer)
5. (Store flyer)
6. (Salesperson)

### Other Sources

7. (Co-worker, family, or friend)
8. (Internet—unspecified)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

- P2. Why did you decide to get rid of the appliance(s) through Efficiency Nova Scotia's Appliance Retirement Program? PROBE: Anything else? (**DO NOT READ – MULTIPLE RESPONSE**)

### Age/Need

1. (Old unit was not working well)
2. (Didn't need/use it any more)

### Replacing unit

3. (Bought new appliance)

**Housing change**

- 4. (Remodeling/expanding)
- 5. (Moving soon/just moved)

**Financial**

- 6. (Reduce energy/electricity costs)
- 7. (Rebate/incentive)
- 8. (Cost too much to have it picked up)
- 9. (Did not want to pay disposal fee at dump/recycling center)
- 10. (Reduce maintenance costs/appliance needed repairs)

**Logistical**

- 11. (Easy/convenient to turn it in)
- 12. (They would pick it up)
- 13. (Trash collection would not accept)

**Energy/Environment**

- 14. (Better for the environment)
- 15. (Wanted to recycle)

**Other**

- 96. (Other [SPECIFY \_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

P3. Before participating, did you have any concerns about taking part in the program?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

P4. [IF P3 = 1] What were those concerns? PROBE: Anything else? [DO NOT READ. ACCEPT ALL RESPONSES]

1. (That I still needed my appliance)
2. (That my appliance is still working/Don't want to get rid of a working appliance)
3. (That there is no benefit to remove my appliance)
4. (Rebates would be too low / insufficient)
5. (The process will be too complicated)
6. (The process would take too long)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

P5. What do you think happens to appliances after they are picked up by the program? PROBE: Anything else? [DON'T READ; MULTIPLE RESPONSE]

1. (They get recycled)
2. (They get rid of the CFCs, refrigerants, freon)
3. (They trash/get rid of it)
4. (They sell it to be reused)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[IF RESPONDENT ASKS WHAT HAPPENS READ "After the program picks up an appliance, they take it to a facility and remove all environmentally hazardous materials, such as capacitors, mercury switches and refrigerants. Ninety-five percent of the unit is recycled including the metal, rubber, plastic and coolants."]

## **Program Satisfaction [S SERIES]**

- S1. Using a scale from 1 to 5 where 1 is “extremely dissatisfied” and 5 is “extremely satisfied” how would you rate your satisfaction with the program overall? [RECORD NUMBER, 98=Don’t know, 99 Refused] DO NOT ACCEPT A RANGE

**[IF S1 = 1 or 2]**

- S2. You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were not satisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]

1. (Too difficult or long to sign up)
2. (My appliance(s) was/were not eligible)
3. (It was hard to schedule a pick-up time)
4. (The pick-up person was unpleasant)
5. (Incentive is too small)
6. (Too long before getting rebate)
7. (Other, specify\_\_\_\_\_)
98. (Don’t know) (Go to S4)
99. (Refused) (Go to S4)

**[IF S1 = 1 or 2]**

- S3. Were there any other reasons you were dissatisfied? [SAME LIST AS S2 ABOVE. DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

- S4. How did you initially sign up for the program? Did you sign up over the phone with a toll free number or did you sign up online?

1. (Over the phone)
2. (Signed up online)
3. (Both)
98. (Don’t know)
99. (Refused)



- S5. Using a scale from 1 to 5 where 1 is “extremely difficult” and 5 is “extremely easy” how difficult or easy was it for you to...? [RANDOMIZE ORDER, ASKING A-B BASED ON SKIP PATTERNS]
- A. [IF S4=2 or 3] Fill out the sign-up form and sign up online
  - B. [IF S4=1 or 3] Call the program and sign up over the phone
  - C. Schedule the time for the pickup
- S6A. [IF S5A < 3] Please describe any difficulties you had in signing up online. [MULTIPLE RESPONSE – RECORD VERBATIM]
- S6B. [IF S5B < 3] Please describe any difficulties you had in signing up over the phone.  
[MULTIPLE RESPONSE – RECORD VERBATIM]
- S6C. [IF S5C < 3] Please describe any difficulties you had in scheduling the pick-up of your appliance(s).  
[MULTIPLE RESPONSE – RECORD VERBATIM]
- S7. Do you have any recommendations for improving the Appliance Retirement Program?  
PROBE: Anything else?
- 1. (Offer more products/measures eligible to rebates)
  - 2. (Offer more information on the products/measures recommended)
  - 3. (Advertise the program more or in a better way)
  - 4. (No recommendation)
  - 96. (Other [SPECIFY \_\_\_\_\_])
  - 98. (Don't know)
  - 99. (Refused)
- S8. Would a figure illustrating the various steps to follow in order to participate in the Appliance Retirement Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?
- 1. — Significantly
  - 2. — Somewhat
  - 3. — Slightly
  - 4. — Not at all
  - 96. (Depends on what the figure or illustration would have been)

- 97. (This kind of document already exists)
- 98. (Don't know)
- 99. (Refused)

[PROGRAMMER: EACH RESPONDENT WILL BE ASKED ABOUT ONE TO TWO APPLIANCES – NOT ALL THREE. NO RESPONDENT WILL BE ASKED ABOUT TWO OF A SAME APPLIANCE (E.G., NOT TWO REFRIGERATORS)].

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## **REFRIGERATORS [RF SERIES]**

[IF V1 = 1 and RF = 0 OR IF V3=0 GO TO FZ1 (FREEZERS)]

[READ IF V1 = 1 and RF = 1 OR IF V3=1], Now, I'd like you to think about the refrigerator you had removed through the program.

[READ IF V1 = 1 and RF > 1 OR IF V3>1] I know you had more than one refrigerator removed through the program. For purposes of this survey, pick just one of the refrigerators removed and keep only that one refrigerator clearly in your mind as you answer the next few questions.

RF1. Was the refrigerator removed through the program the main one used in the home, a second refrigerator that was being used at least part of the time, or a refrigerator that was not being used at all?

IF CLARIFICATION NECESSARY: "A main or primary refrigerator would typically be located in the kitchen, plugged in or "on" all the time, and used for regular household purposes. A secondary or spare refrigerator is typically located somewhere other than in the kitchen and may be plugged in or "on" all or only part of the time." [NOTE: If respondent recently bought a new refrigerator and was just waiting for the previously used one to be picked up by the program, it should be classified as "Main/Primary"]

1. Used as Main/Primary
2. Used as a Spare/Secondary at date of pickup
3. Not being used
98. (Don't know) [PROBE: READ CLARIFICATION AND TRY TO CLASSIFY STATUS OF REFRIGERATOR]
99. (Refused)

RF2. Approximately how old was the refrigerator you had removed through the program? Was it [READ, CHECK ONE]:

1. 0 to 5 years old
2. 6 to 10 years old
3. 11 to 15 years old
4. 16 to 20 years old
5. More than 20 years old
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE?' RECORD]
99. (Refused)

- RF3. [IF RF1=2] Approximately how long had you been using the refrigerator as a secondary refrigerator when you decided to get rid of it? [RECORD]
1. Months [RECORD 1 to 11 months]
  2. Years [RECORD 1 to 50 years; round to the nearest year]
  98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME IT HAD BEEN USED AS A SECONDARY REFRIGERATOR?' RECORD]
  99. (Refused)
- RF4. [IF RF1 = 3] Approximately how long had the refrigerator been unused when you decided to get rid of it? [RECORD]
1. Months [RECORD 1 to 11 months]
  2. Years [RECORD 1 to 50 years; round to the nearest year]
  98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME IT HAD BEEN UNUSED IN YOUR HOUSEHOLD?' RECORD]
  99. (Refused)
- RF5. Was the refrigerator in working condition when you decided to have it picked up by the program? READ
1. Yes
  2. Yes, but not that well
  3. No
  98. (Don't know)
  99. (Refused)
- RF6. [IF RF1=2 or 3] In the year prior to getting rid of the refrigerator, how often did you have the refrigerator plugged in? Was it plugged in [READ, CHECK ONLY ONE]:
1. All the time
  2. Most of time
  3. Occasionally
  4. Never [GO TO RF8]
  98. (Don't know) [GO TO RF8]
  99. (Refused) [GO TO RF8]
- RF7. [IF .RF6< 4] How important for your household food and beverage storage needs is it to have a secondary refrigerator? Answer on a scale of 1 to 5, where 1 is 'not at all necessary' and 5 is 'absolutely necessary.' [RECORD NUMBER, 98 don't know, 99 Refused]:

RF8. Where in the house was the refrigerator most recently located? [RANDOMIZE AND READ 1-5, THEN 96 – CHECK ONLY ONE]

- 1. Basement
- 2. Kitchen
- 3. Garage
- 4. Porch
- 5. Laundry room
- 96. Some other place [SPECIFY \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

RF9. Is the space where the refrigerator was located heated in the winter?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

RF10. Is the space where the refrigerator was located cooled in the summer?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

## **REFRIGERATOR FREE-RIDERSHIP SECTION [RFR Series]**

Please continue thinking about just that one refrigerator.

RFR1. Had you **already** considered disposing of the refrigerator **before** you heard about Efficiency Nova Scotia's Appliance Retirement Program? By dispose of, I mean getting the appliance out of your home by selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.

- 1. Yes
- 2. No [Go to RE1]
- 98. (Don't know)
- 99. (Refused)

RFR2. I am going to read a list of alternative ways that you could have disposed of this appliance. For each, tell me if this is a method you had considered using or doing. [RANDOMIZE] Did you consider ...

a. Selling it

\_\_\_ 1.Yes - Considered \_\_\_ 2. No – Did not consider \_\_\_ 98. Don't Know \_ 99. Refused

b. Giving it away for free

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99. Refused

c. Taking it to a recycling center

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98. Don't Know \_ 99.Refused

d. Hiring someone to take it for recycling

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98. Don't Know \_ 99.Refused

e. Taking it to a garbage dump or put out as trash

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

f. Hiring hauler to take it away for junking or dumping

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

g. Having a retail store come and pick it up

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

h. Continuing to use it

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

i. Storing it unplugged

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

j. Postponing getting rid of it.

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

RFR3. Now suppose that the Efficiency Nova Scotia Appliance Retirement Program that you used to dispose of this refrigerator had not been available. Which one of these other alternatives that we've just discussed would you have been most likely to do? (DO NOT READ; INDICATE ONE RESPONSE ONLY)

IF NEEDED: Your best estimate is okay.

1. (Sold it)
2. (Given it away for free)
3. (Taken it to a recycling center)
4. (Hired someone to take it for recycling)
5. (Taken it to a garbage dump or put out as trash)
6. (Hired hauler to take it away for junking or dumping)
7. (Had a retail store come and pick it up)
8. (Continued to use it)
9. (Store it unplugged)
10. (Postponed getting rid of it)
96. (Other, specify \_\_\_\_\_)
98. (Don't Know)
99. (Refused)

[ASK IF RFR3 = 10]

RFR4. You indicated that without the Program, you would have postponed getting rid of your refrigerator. How soon would you have disposed of your old refrigerator? Would you have disposed of it within a year of when the Program took it or more than a year later?

1. Within a year of when the program took it
2. More than a year later
98. Don't Know
99. Refused

RFR5. Efficiency Nova Scotia paid for the refrigerator to be removed from your home and recycled. The approximate value of this service is \$60. If you had not received these services for free from Efficiency Nova Scotia, how likely is it that you would have paid the full cost of recycling the refrigerator yourself? Please answer on a 10 point scale with a 0 meaning “Very Unlikely” and a 10 meaning “Very Likely”. Again, the approximate cost of removal and recycling would have been \$60. [DO NOT ACCEPT A RANGE]

\_\_\_Response

98. (Don’t know)

99. (Refused)

RFR6. Next, I’m going to ask you to rate the importance of the Appliance Retirement Program as well as other factors that might have influenced your decision to remove your refrigerator. Using a scale from 0 to 10, where 0 means “Not at all important” and 10 means “Extremely important”, please rate the importance of each of the following in your decision to remove your refrigerator.

| Factor<br>(READ AND RANDOMIZE)                                             | Responses                                         |
|----------------------------------------------------------------------------|---------------------------------------------------|
| a. The \$35 incentive provided by Efficiency Nova Scotia                   | ___ Response    ___98 Don’t Know    ___99 Refused |
| b. Information or advice received from the program                         | ___ Response    ___98 Don’t Know    ___99 Refused |
| c. Removal and recycling services provided for free as part of the program | ___ Response    ___98 Don’t Know    ___99 Refused |

RFR7. If the Efficiency Nova Scotia Appliance Retirement Program had **not** been available, how much, if anything, would you have been willing to pay someone to remove or recycle your refrigerator for you?

1. \$0—Would not pay any amount

2. [RECORD DOLLARS \$1 to \$999] \$\_\_\_\_\_

98. (Don’t know) [PROBE: ‘CAN YOU GIVE AN APPROXIMATE ESTIMATE OF HOW MUCH YOU WOULD PAY?’ RECORD]

99. (Refused)



## Replacement Refrigerator (RE Series)

RE1. Did you replace the refrigerator that you turned in through Efficiency Nova Scotia's Appliance Retirement Program?

- 1. Yes
- 2. No [GO TO RRF1]
- 98. (Don't know) [GO TO RRF1]
- 99. (Refused) [GO TO RRF1]

RE2. Was the replacement refrigerator new or used when you started using it as the replacement refrigerator?

- 1. New
- 2. Used
- 98. (Don't know)
- 99. (Refused)

RE3. Where did you get the replacement refrigerator? [DON'T READ]

- 1. (Sears)
- 2. (Home Depot)
- 3. (Best Buy)
- 4. (Lowe's)
- 5. (Wal-Mart)
- 6. (Target)
- 7. (Sam's Club)
- 8. (Costco)
- 9. (Yard/garage sale)
- 10. (Friend/relative)
- 11. (Got new main/primary refrigerator and now using the older one as spare/secondary refrigerator)
- 12. (Internet [SPECIFY site name/address\_\_\_\_\_])
- 96. (Other [SPECIFY\_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

RE4. Does your replacement refrigerator have the ENERGY STAR label? There would usually be a blue and white sticker on the appliance that says “ENERGY STAR.”

1. Yes
2. No
98. (Don’t know)
99. (Refused)

## **REMAINING REFRIGERATORS (RRF SERIES)**

RRF1. How many refrigerators are currently in use in your home since you removed a refrigerator through the program?

[RECORD NUMBER]\_\_\_\_\_ [98 Don’t know, 99 Refused] [IF 0 GO TO FZ1 (Freezer Series)].

IF ‘DON’T KNOW’ OR ‘REFUSED’ TO RRF1, SKIP TO FZ SERIES

RRF2a through RRF2c. [FOR EACH REFRIGERATOR IN RRF1, ASK “Approximately how old is your refrigerator.” [IF MORE THAN ONE REFRIGERATOR, ASK ABOUT UP TO THREE REFRIGERATORS INSERTING “first”, “second,” or “third” BEFORE “refrigerator” AS APPROPRIATE, BASED ON RRF1 RESPONSE.]

1. 0 to 5 years old
2. 6 to 10 years old
3. 11 to 15 years old
4. 16 to 20 years old
5. More than 20 years old
98. (Don’t know) [PROBE: ‘CAN YOU GIVE AN APPROXIMATE AGE OF THIS REFRIGERATOR?’ RECORD]
99. (Refused)

ROTATE TWO OF REFRIGERATOR/FREEZER/DEHUMIDIFIER SECTIONS, IF RESPONDENT QUALIFIES FOR MORE THAN ONE SECTION (DO NOT ADMINISTER ALL THREE SECTIONS)

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## **FREEZER [FZ SERIES]**

[IF V1 = 1 and FZ > 0 OR IF V4>0 (had freezer removed) ASK FZ SERIES, OTHERWISE SKIP TO DH1 (Dehumidifier Series)]

[READ IF V1 = 1 and FZ = 1 OR IF V4=1] Now, I'd like you to think about the stand-alone freezer you had removed through the program.

[READ IF V1 = 1 and FZ > 1 OR IF V4>1] I know you had more than one stand-alone freezer removed through the program. For purposes of this survey, pick just one of the freezers removed and keep just that one freezer clearly in your mind as you answer the next few questions.

FZ1. In the year prior to getting rid of the freezer, how often did you have the freezer plugged in? Was it plugged in [READ, CHECK ONLY ONE]:

1. All the time
2. Most of time
3. Occasionally
4. Never
98. (Don't know)
99. (Refused)

FZ2. Approximately how old was the freezer you had removed through the program? Was it [READ, CHECK ONE]:

1. 0 to 5 years old
2. 6 to 10 years old
3. 11 to 15 years old
4. 16 to 20 years old
5. More than 20 years old
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE?' RECORD]
99. (Refused)

FZ3. Was the freezer in working condition when you decided to have it picked up by the program?  
READ

1. Yes
2. Yes, but not that well
3. No
98. (Don't know)
99. (Refused)

- FZ4. [IF FZ1 = 4 (Never used)] Approximately how long had the freezer been unused when you decided to get rid of it? [RECORD]
1. Months [RECORD 1 to 11 months]
  2. Years [RECORD 1 to 50 years; round to the nearest year]
  98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME THAT THE FREEZER HAD BEEN UNUSED?' RECORD]
  99. (Refused)
- FZ5. [IF FZ1 ≠ 4 (Used at least occasionally or DK/Ref)] Approximately how long had you been using the freezer when you decided to get rid of it? [RECORD]
1. Months [RECORD 1 to 11 months]
  2. Years [RECORD 1 to 50 years, round to the nearest year]
  98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME THAT THE FREEZER HAD BEEN IN USE?' RECORD]
  99. (Refused)
- FZ6. How important for your household food storage needs is it to have a stand-alone freezer? Answer on a scale of 1 to 5, where 1 is 'not at all necessary' and 5 is 'absolutely necessary.' [RECORD NUMBER, 98 don't know, 99 Refused]:
- FZ7. Where in the house was the freezer located? [RANDOMIZE AND READ 1-5, THEN 96 – CHECK ONLY ONE]
1. Basement
  2. Kitchen
  3. Garage
  4. Porch
  5. Laundry room
  96. Some other place [SPECIFY \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- FZ8. Is the space where the freezer was located heated in the winter?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

FZ9. Is the space where the freezer was located cooled in the summer?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

## **FREEZER FREE-RIDERSHIP [FFR Series]**

Please continue thinking about just that one freezer.

FFR1. Had you already considered disposing of the freezer **before** you heard about Efficiency Nova Scotia's Appliance Retirement Program? By dispose of, I mean getting the appliance out of your home by selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.

- 1. Yes
- 2. No **[Go to FE1]**
- 98. (Don't know)
- 99. (Refused)

FFR2. I am going to read a list of alternative ways that you could have disposed of this appliance. For each, tell me if this is a method you had considered using or doing. [RANDOMIZE] Did you consider ...

a. Selling it

\_\_\_1.Yes - Considered \_\_\_2. No – Did not consider \_\_\_ 98. Don't Know \_ 99. Refused

b. Giving it away for free

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99. Refused

c. Taking it to a recycling center

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_98. Don't Know \_ 99.Refused

d. Hiring someone to take it for recycling

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_98. Don't Know \_ 99.Refused

- e. Taking it to a garbage dump or put out as trash  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused
- f. Hiring hauler to take it away for junking or dumping  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused
- g. Having a retail store come and pick it up  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused
- h. Continuing to use it  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused
- i. Storing it unplugged  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused
- j. Postponing getting rid of it.  
☐ 1.Yes - Considered   ☐ 2.No – Did not Consider   ☐ 98.Don't Know   ☐ 99.Refused

**FFR3.** Now suppose that the Efficiency Nova Scotia Appliance Retirement Program that you used to dispose of this freezer had not been available. Which one of these other alternatives that we've just discussed would you have been most likely to do? (DO NOT READ; INDICATE ONE RESPONSE ONLY)

**IF NEEDED:** Your best estimate is okay.

- 1. (Sold it)
- 2. (Given it away for free)
- 3. (Taken it to a recycling center)
- 4. (Hired someone to take it for recycling)
- 5. (Taken it to a garbage dump or put out as trash)
- 6. (Hired hauler to take it away for junking or dumping)
- 7. (Had a retail store come and pick it up)
- 8. (Continued to use it)
- 9. (Store it unplugged)
- 10. (Postponed getting rid of it)
- 96. (Other, specify \_\_\_\_\_)
- 98. (Don't Know)
- 99. (Refused)

[ASK FFR4 IF FFR3 = 10]

FFR4. You indicated that without the Program, you would have postponed getting rid of your freezer. How soon would you have disposed of your old freezer? Would you have disposed of it within a year of when the Program took it or more than a year later?

1. Within a year of when the program took it
2. More than a year later
98. (Don't Know)
99. (Refused)

FFR5. Efficiency Nova Scotia paid for the freezer to be removed from your home and recycled. The approximate value of this service is \$60. If you had not received these services for free from Efficiency Nova Scotia, how likely is it that you would have paid the full cost of recycling the freezer yourself? Please answer on a 10 point scale with a 0 meaning "Very Unlikely" and a 10 meaning "Very Likely". Again, the approximate cost of removal and recycling would have been \$60.

- \_\_\_ Response
98. (Don't know)
  99. (Refused)

FFR6. Next, I'm going to ask you to rate the importance of the Appliance Retirement Program as well as other factors that might have influenced your decision to remove your freezer. Using a scale from 0 to 10, where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to remove your freezer.

| Factor<br>(READ AND RANDOMIZE)                                             | Responses                                         |
|----------------------------------------------------------------------------|---------------------------------------------------|
| a. The \$35 incentive provided by Efficiency Nova Scotia                   | ___ Response    ___98 Don't Know    ___99 Refused |
| b. Information or advice received from the program                         | ___ Response    ___98 Don't Know    ___99 Refused |
| c. Removal and recycling services provided for free as part of the program | ___ Response    ___98 Don't Know    ___99 Refused |

FFR7. If the Efficiency Nova Scotia Appliance Retirement Program had **not** been available, how much, if anything, would you have been willing to pay someone to remove or recycle your freezer for you?

1. \$0—Would not pay any amount
2. [RECORD DOLLARS \$1 to \$999] \$\_\_\_\_\_
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE ESTIMATE OF HOW MUCH YOU WOULD PAY?' RECORD]
99. (Refused)

## **Replacement Freezer Questions (FE Series)**

FE1. Did you get another freezer to replace the one you turned in through Efficiency Nova Scotia's Appliance Retirement Program?

1. Yes
2. No [GO TO RFZ1]
98. (Don't know) [GO TO RFZ1]
99. (Refused) [GO TO RFZ1]

FE2. Was the replacement freezer new or used when you started using it as the replacement freezer?

1. New
2. Used
98. (Don't know)
99. (Refused)

FE3. Where did you get the replacement freezer? [DON'T READ]

1. (Sears)
2. (Home Depot)
3. (Best Buy)
4. (Lowe's)
5. (Wal-Mart)
6. (Target)
7. (Sam's Club)
8. (Costco)
9. (Yard/garage sale)
10. (Friend/relative)



- 11. (Got new main/primary freezer and now using the older one as spare/secondary freezer)
- 12. (Internet [SPECIFY site name/address\_\_\_\_\_])
- 96. (Other [SPECIFY\_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

FE4. Does your replacement freezer have the ENERGY STAR label? There would usually be a blue and white sticker on the appliance that says "ENERGY STAR."

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

## **REMAINING FREEZERS [RFZ SERIES]**

RFZ1. How many stand-alone freezers are currently in use in your home?

[RECORD NUMBER]\_\_\_\_\_ [RECORD NUMBER, 98 Don't know, 99 Refused] [IF 0 GO TO DH SERIES].

IF "DON'T KNOW" OR "REFUSED" IN RFZ1, GO TO DH SERIES

RFZ2a through RFZ2c. [FOR EACH FREEZER IN RFZ1, ASK "Approximately how old is your freezer." [IF MORE THAN ONE FREEZER, ASK ABOUT UP TO THREE FREEZERS INSERTING "first", "second," or "third" BEFORE "freezer" AS APPROPRIATE, BASED ON RFZ1 RESPONSE.]

- 1. 0 to 5 years old
- 2. 6 to 10 years old
- 3. 11 to 15 years old
- 4. 16 to 20 years old
- 5. More than 20 years old
- 98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE OF THIS FREEZER?']
- 99. (Refused)

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## **DEHUMIDIFIERS [DH SERIES]**

[IF V1 = 1 and DH > 0 OR IF V5>0 (had dehumidifier removed) ASK DH SERIES, OTHERWISE SKIP TO SO SERIES

[READ IF V1 = 1 and DH = 1 OR IF V5=1] Now, I'd like you to think about the dehumidifier you had removed through the program.

[READ IF V1 = 1 and DH > 1 OR IF V5>1] I know you had more than one dehumidifier removed through the program. For purposes of this survey, pick just one of the dehumidifiers removed and keep just that one dehumidifier clearly in your mind as you answer the next few questions.

DH1. In the year prior to getting rid of the dehumidifier, how often did you have the dehumidifier plugged in? Was it plugged in [READ, CHECK ONLY ONE]:

1. All the time
2. Most of time
3. Occasionally
4. Never
98. (Don't know)
99. (Refused)

DH2. Approximately how old was the dehumidifier you had removed through the program? Was it [READ, CHECK ONE]:

1. 0 to 5 years old
2. 6 to 10 years old
3. 11 to 15 years old
4. 16 to 20 years old
5. More than 20 years old
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE?' RECORD]
99. (Refused)

DH3. Was the dehumidifier in working condition when you decided to have it picked up by the program? READ

1. Yes
2. Yes, but not that well
3. No
98. (Don't know)
99. (Refused)

DH4. [IF DH1 = 4 (Never used)] Approximately how long had the dehumidifier been unused when you decided to get rid of it?

1. Months [RECORD 1 to 11 months]
2. Years [RECORD 1 to 50 years; round to the nearest year]
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME THAT THE DEHUMIDIFIER HAD BEEN UNUSED?' RECORD]
99. (Refused)

[IF DH1=4 GO TO DFR1-Dehumidifier Free-rider Series]

DH5. [IF DH1 ≠ 4 (Used at least occasionally or DK/Ref)] Approximately how long had you been using the dehumidifier when you decided to get rid of it?

1. Months [RECORD 1 to 11 months]
2. Years [RECORD 1 to 50 years, round to the nearest year]

(Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE LENGTH OF TIME THAT THE DEHUMIDIFIER HAD BEEN IN USE?' RECORD]

98. [\_\_\_\_\_]
99. (Refused)

DH6. Where in the house was the dehumidifier located? [RANDOMIZE AND READ 1-5, THEN 96–CHECK ONLY ONE]

1. Basement
2. Kitchen
3. Garage
4. Porch
5. Laundry room
96. Some other place [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

## DEHUMIDIFIER FREE-RIDERSHIP [DFR Series]

Please continue thinking about just that one dehumidifier.

DFR1. Had you already considered disposing of the dehumidifier before you heard about Efficiency Nova Scotia's Appliance Retirement Program? By dispose of, I mean getting the appliance out of your home by selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.

- 1. Yes
- 2. No **[Go to DHE1]**
- 98. (Don't know)
- 99. (Refused)

DFR2. I am going to read a list of alternative ways that you could have disposed of this appliance. For each, tell me if this is a method you had considered using or doing. [RANDOMIZE] Did you consider ...

a. Selling it

\_\_\_ 1.Yes - Considered \_\_\_ 2. No – Did not consider \_\_\_ 98. Don't Know \_ 99. Refused

b. Giving it away for free

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99. Refused

c. Taking it to a recycling center

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98. Don't Know \_ 99.Refused

d. Hiring someone to take it for recycling

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98. Don't Know \_ 99.Refused

e. Taking it to a garbage dump or put out as trash

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

f. Hiring hauler to take it away for junking or dumping

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

g. Having a retail store come and pick it up

\_\_\_ 1.Yes - Considered \_\_\_ 2.No – Did not Consider \_\_\_ 98.Don't Know \_ 99.Refused

h. Continuing to use it

☐ 1.Yes - Considered ☐ 2.No – Did not Consider ☐ 98.Don't Know ☐ 99.Refused

i. Storing it unplugged

☐ 1.Yes - Considered ☐ 2.No – Did not Consider ☐ 98.Don't Know ☐ 99.Refused

j. Postponing getting rid of it.

☐ 1.Yes - Considered ☐ 2.No – Did not Consider ☐ 98.Don't Know ☐ 99.Refused

DFR3. Now suppose that the Efficiency Nova Scotia Appliance Retirement Program that you used to dispose of this dehumidifier had not been available. Which one of these other alternatives that we've just discussed would you have been most likely to do? (DO NOT READ; INDICATE ONE RESPONSE ONLY)

NEEDED: Your best estimate is okay.

1. (Sold it)
2. (Given it away for free)
3. (Taken it to a recycling center)
4. (Hired someone to take it for recycling)
5. (Taken it to a garbage dump or put out as trash)
6. (Hired hauler to take it away for junking or dumping)
7. (Had a retail store come and pick it up)
8. (Continued to use it)
9. (Store it unplugged)
10. (Postponed getting rid of it)
96. (Other, specify \_\_\_\_\_)
98. (Don't Know)
99. (Refused)

[ASK DFR4 IF DFR3 = 10]

DFR4. You indicated that without the Program, you would have postponed getting rid of your dehumidifier. How soon would you have disposed of your old dehumidifier? Would you have disposed of it within a year of when the Program took it or more than a year later?

1. Within a year of when the program took it
2. More than a year later
98. (Don't Know)
99. (Refused)

DFR5. Efficiency Nova Scotia paid for the dehumidifier to be removed from your home and recycled. The approximate value of this service is \$60. If you had not received these services for free from Efficiency Nova Scotia, how likely is it that you would have paid the full cost of recycling the dehumidifier yourself? Please answer on a 10 point scale with a 0 meaning "Very Unlikely" and a 10 meaning "Very Likely". Again, the approximate cost of removal and recycling would have been \$60.

\_\_\_ Response

98. (Don't know)
99. (Refused)

DFR6. Next, I'm going to ask you to rate the importance of the Appliance Retirement Program as well as other factors that might have influenced your decision to remove your dehumidifier. Using a scale from 0 to 10, where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to remove your dehumidifier.

| Factor<br>(READ AND RANDOMIZE)                                             | Responses                                         |
|----------------------------------------------------------------------------|---------------------------------------------------|
| a. The \$10 incentive provided by Efficiency Nova Scotia                   | ___ Response    ___98 Don't Know    ___99 Refused |
| b. Information or advice received from the program                         | ___ Response    ___98 Don't Know    ___99 Refused |
| c. Removal and recycling services provided for free as part of the program | ___ Response    ___98 Don't Know    ___99 Refused |

DFR7. If the Efficiency Nova Scotia Appliance Retirement Program had not been available, how much, if anything, would you have been willing to pay someone to remove or recycle your dehumidifier for you?

1. \$0—Would not pay any amount
2. [RECORD DOLLARS \$1 to \$999] \$\_\_\_\_\_
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE ESTIMATE OF HOW MUCH YOU WOULD PAY?' RECORD]
99. (Refused)

## **Replacement Dehumidifier Questions (DHE Series)**

DHE1. Did you get another dehumidifier to replace the one you turned in through Efficiency Nova Scotia's Appliance Retirement Program?

1. Yes
2. No [GO TO DHZ1]
98. (Don't know) [GO TO DHZ1]
99. (Refused) [GO TO DHZ1]

DHE2. Was the replacement dehumidifier new or used when you started using it as the replacement dehumidifier?

1. New
2. Used
98. (Don't know)
99. (Refused)

DHE3. Where did you get the replacement dehumidifier? [DON'T READ]

1. (Sears)
2. (Home Depot)
3. (Best Buy)
4. (Lowe's)
5. (Wal-Mart)
6. (Target)
7. (Sam's Club)
8. (Yard/garage sale)
9. (Friend/relative)

- 10. (Got new main/primary dehumidifier and now using the older one as spare/secondary dehumidifier)
- 11. (Internet [SPECIFY site name/address\_\_\_\_\_])
- 96. (Other [SPECIFY\_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

DHE4. Does your replacement dehumidifier have the ENERGY STAR label? There would usually be a blue and white sticker on the appliance that says "ENERGY STAR."

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)



## REMAINING DEHUMIDIFIERS [DHZ SERIES]

DHZ1. How many stand-alone dehumidifiers are currently in use in your home?

[RECORD NUMBER]\_\_\_\_\_ [RECORD NUMBER, 98 Don't know, 99 Refused] [IF 0 GO TO SO SERIES]

IF "DON'T KNOW" OR 'REFUSED' IN DHZ1, GO TO SO SERIES

DHZ2a through DHZ2c      [FOR EACH DEHUMIDIFIER IN DHZ1, ASK "Approximately how old is your dehumidifier." [IF MORE THAN ONE DEHUMIDIFIER, ASK ABOUT UP TO THREE DEHUMIDIFIERS INSERTING "first", "second," or "third" BEFORE "dehumidifier" AS APPROPRIATE, BASED ON DHZ1 RESPONSE.]

1. 0 to 5 years old
2. 6 to 10 years old
3. 11 to 15 years old
4. 16 to 20 years old
5. More than 20 years old
98. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE OF THIS DEHUMIDIFIER?']
99. (Refused)

## SPILOVER [SO Series]

SO1. Since participating in Efficiency Nova Scotia's Appliance Retirement Program, have you disposed of other appliances without receiving a rebate?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[GO TO IM1 IF SO1=2 OR 98 OR 99]

SO2. What other appliance(s) have you disposed of WITHOUT RECEIVING A REBATE since participating in Efficiency Nova Scotia's Appliance retirement program? [READ IN ORDER – CODE ONE ONLY PER STATEMENT]

- a. Other refrigerator
- b. Other stand-alone freezer
- c. Other dehumidifier
- d. Room air conditioner

- 1 (Yes)
- 2 (No)
- 98. (Don't know)
- 99. (Refused)

[go TO iM1 IF 2 or 98 or 99 to all of so2a-d]

SO3. How did you dispose of [this/these] appliance(s)? Did you... [READ, CHECK ALL THAT APPLY]

- 1. Sell it/ them
- 2. Give it/them away for free
- 3. Take it/them to a recycling center or hired someone to take it/them for recycling
- 4. Take it/them to a garbage dump or put out as trash
- 5. Hire hauler to take it/them away
- 6. Have a retail store come and pick it/them up
- 96. Or did you do something else? [SPECIFY]\_\_\_\_\_
- 98. (Don't know)
- 99. (Refused)

SO4. How influential was your experience with the Appliance Retirement Program on your decision to dispose of this or these additional appliance(s) WITHOUT RECEIVING A REBATE? Please give your answer on a scale of 0 to 10, where 0 indicates that the program "had no influence at all on your decision to dispose of this or these additional appliance(s)" and 10 indicates that the program was "extremely influential to your decision to dispose of this or these additional appliance(s)." [RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] [DO NOT ACCEPT A RANGE]

## **Impact of measures [IM series]**

IM1. Please indicate how each of the following has changed since participating in the Appliance Retirement Program? On a scale of 1 to 5, where 1 means “no improvement” and 5 means a “considerable improvement”, how much has [READ EACH ONE, RANDOMIZE] improved?

- a. The Reduction in total energy costs
- b. Your interest in Energy efficiency
- c. Your knowledge of Energy efficiency
- d. Your knowledge of Appliances

IM2. What, if any, negative consequences have you experienced from removing your appliances through the Appliance Retirement Program? [DON'T READ, PROBE; MULTIPLE RESPONSE]

1. (No drawbacks)
2. (Loss of food storage space)
3. (Loss of other storage space)
4. (House no longer cool)
5. (House more humid)
6. (Usable appliances are thrown away)
96. (Other SPECIFY \_\_\_\_\_)
98. (Don't know)
99. (Refused)

IM3. Would you recommend the Appliance Retirement Program to a family member or friend?

1. Yes
2. No
98. (Don't know)
99. (Refused)

IM4. [IF IM3 = 2 “NO”] Why not? [RECORD VERBATIM – 98=Don't know, 99=Refused]

## DEMOGRAPHICS [D Series]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-7, then 96; SELECT ONE RESPONSE]

1. Detached single-family home
2. Semi-detached house
3. Mobile home or house trailer
4. Townhouse or duplex which share adjacent walls
5. Row house (Single story apartment building)
6. Apartment building that has fewer than five stories
7. Apartment building that has five or more stories
96. Other [SPECIFY: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

D2. How many bedrooms are in your home?\_[88=DK; Enter zero for a studio apartment with no bedrooms]

D3. Do you own or rent this home?

1. Own/buying
2. Rent/lease
3. Other (Describe) \_\_\_\_\_

D4. Do you pay the electric bills for your home?

1. Yes
2. No
98. (Don't Know)
99. (Refused)

D5. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home
96. (Other Specify \_\_\_\_\_)
98. (Don't know)
99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]

D7. What is your age group? Are you... [READ LIST; SELECT ONE RESPONSE]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation certificate)
2. (High school graduation certificate and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University certificate or diploma)
98. (Don't know)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
8. \$80,000 or more
98. (Don't know)
99. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

END. Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## APPENDIX VII - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Order ID: \_\_\_\_\_

Site contact name: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

### 2 APPLIANCE INFORMATION

*Validate database information with site contact:*

| Appliance              | Number of Units Retired |            | Date of Retirement    |            |
|------------------------|-------------------------|------------|-----------------------|------------|
|                        | Database Info           | Validation | Database Info         | Validation |
| Refrigerators:         | <i>To be competed</i>   |            | <i>To be competed</i> |            |
| Stand-Alone Freezers:  | <i>To be competed</i>   |            | <i>To be competed</i> |            |
| Dehumidifiers:         | <i>To be competed</i>   |            | <i>To be competed</i> |            |
| Room Air Conditioners: | <i>To be competed</i>   |            | <i>To be competed</i> |            |

## 2.1 REFRIGERATORS (IF APPLICABLE)

### Replacement Information (*site contact declaration*)

Number of primary refrigerators retired:

---

Number replaced with a **new** refrigerator:

---

Number replaced with a **used** refrigerator:

---

Number of secondary refrigerators retired:

---

Number replaced with a **new** refrigerator:

---

Number replaced with a **used** refrigerator:

---

Number **not** replaced at all:

---

### Secondary Refrigerator Usage (*site contact declaration*)

| Amount of time plugged in:                        | All the Time | Most of the Time | Occasionally | Never |
|---------------------------------------------------|--------------|------------------|--------------|-------|
| For a secondary refrigerator replaced:            |              |                  |              |       |
| For a secondary refrigerator <b>not</b> replaced: |              |                  |              |       |



**New Refrigerator Information (*on-site observation or on manufacturer's website*)**

**Primary refrigerator information (if replaced through the program):**

New or used unit?: \_\_\_\_\_

Brand: \_\_\_\_\_

Model number: \_\_\_\_\_

Capacity [in cubic feet]: \_\_\_\_\_

Smaller, bigger or same size as the retired unit: \_\_\_\_\_ (*site contact declaration*)

Energy consumption [kWh/year]: \_\_\_\_\_

ENERGY STAR rating: \_\_\_\_\_

**Secondary refrigerator information (if replaced through the program):**

New or used unit?: \_\_\_\_\_

Brand: \_\_\_\_\_

Model number: \_\_\_\_\_

Capacity [in cubic feet]: \_\_\_\_\_

Smaller, bigger or same size as the retired unit: \_\_\_\_\_ (*site contact declaration*)

Energy consumption [kWh/year]: \_\_\_\_\_

ENERGY STAR rating: \_\_\_\_\_

## 2.2 FREEZERS (IF APPLICABLE)

### Replacement Information (*site contact declaration*)

Number of stand-alone freezers retired:

---

Number replaced with a **new** freezer:

---

Number replaced with a **used** freezer:

---

Number **not** replaced at all:

---

### Secondary Freezer Usage (*site contact declaration*)

| Amount of time plugged in:                   | All the Time | Most of the Time | Occasionally | Never |
|----------------------------------------------|--------------|------------------|--------------|-------|
| For a secondary freezer replaced:            |              |                  |              |       |
| For a secondary freezer <b>not</b> replaced: |              |                  |              |       |

### New Freezer Information (*on-site observation or on manufacturer's website*)

New or used unit?:

---

Brand:

---

Model number:

---

Capacity [in cubic feet]:

---

Smaller, bigger or same size as the retired unit:

---

(*contact declaration*)

Energy consumption [kWh/year]:

---

ENERGY STAR rating:

---

## 2.3 DEHUMIDIFIERS (IF APPLICABLE)

### Replacement Information (*site contact declaration*)

Number of dehumidifiers retired:

Number replaced with a **new** dehumidifier:

Number replaced with a **used** dehumidifier:

Number **not** replaced at all:

### Article I. Dehumidifier Usage (*site contact declaration*)

Number of months per year plugged in:

Number of hours per day in operation:

### New Dehumidifier Information (*on-site observation or on manufacturer's website*)

New or used unit?:

Brand:

Model number:

Capacity [in liters]:

Smaller, bigger or same size as the retired unit:

(*contact declaration*)

ENERGY STAR rating:

## APPENDIX VIII - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the ARet program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before learning about the program, had you already considered disposing of the refrigerator?                                                                                                                                                                                                                                                                                                                                                                                                                             | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                                                 |
| <b>FR3.</b> In the absence of the program, which alternative would you have been most likely to do?<br>1. (Sold it)<br>2. (Given it away for free)<br>3. (Taken it to a recycling center)<br>4. (Hired someone to take it for recycling)<br>5. (Taken it to a garbage dump or put out as trash)<br>6. (Hired hauler to take it away for junking or dumping)<br>7. (Had a retail store come and pick it up)<br>8. (Continued to use it)<br>9. (Store it unplugged)<br>10. (Postponed getting rid of it)<br>99. (Don't Know / Refused) | IF 1. : FR3 = 0%<br>IF 2. : FR3 = 0%<br>IF 3. : FR3 = 100%<br>IF 4. : FR3 = 100%<br>IF 5. : FR3 = 50%<br>IF 6. : FR3 = 50%<br>IF 7. : FR3 = 50%<br>IF 8. : FR3 = 0%<br>IF 9. : FR3 = 50%<br>IF 10. : FR3 = 0% |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>FR3</b>                                                                                                                                                                                                    |
| <b>FR5.</b> ENSC paid for your appliance to be removed from your home and recycled. If you had not received these services for free, how likely is it that you would have paid the full cost of recycling your appliance yourself? (Scale 0 to 10)                                                                                                                                                                                                                                                                                   | FR5 = Answer x 10%                                                                                                                                                                                            |
| <b>FR7.</b> In the absence of the program, how much would you have been willing to pay someone to recycle your refrigerator for you? (Amount in \$)                                                                                                                                                                                                                                                                                                                                                                                  | FR7 = Amount in \$ / \$60                                                                                                                                                                                     |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>MEAN VALUE OF:<br/>(FR5 ; FR7)</b>                                                                                                                                                                         |
| <b>Adjusted PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>IF FR1 = 0% : 0%<br/>IF FR1 = 100% : PA2</b>                                                                                                                                                               |
| <b>FR6.</b> Level of influence (Scale 0 to 10)<br>Factors a, b and c = Program factors                                                                                                                                                                                                                                                                                                                                                                                                                                               | FR6_P = MAX(a; b; c)                                                                                                                                                                                          |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>(10 - FR4_P) x 10%</b>                                                                                                                                                                                     |
| <b>FR4.</b> [Ask if FR3 = 10] How soon would you have disposed of your old appliance?<br>1. Within a year of when the program took it<br>2. More than a year later<br>99. (Don't Know / Refused)                                                                                                                                                                                                                                                                                                                                     | IF 1. : FR4 = EMPTY<br>IF 2. : FR4 = 0%                                                                                                                                                                       |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>FR4</b>                                                                                                                                                                                                    |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>MEAN VALUE OF :<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                                            |

Subsequently, the final free-ridership level calculated for each participant was submitted to an inconsistency test. The inconsistency test consisted in verifying if  $(FR5 - FR7) \geq 30\%$ . In that case, the participant's answers to FR5 and FR7 represented an inconsistency and PA2 became equal to the smallest value between FR5 and FR7. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.





# **EFFICIENT PRODUCTS – APPLIANCE REPLACEMENT PROGRAM IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**



Final Report



February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Appliance Replacement (ARep) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and the retailer partner as well as on two on-site visits.

## **PROGRAM OVERVIEW**

Launched as a market transformation and resource acquisition program, the ARep program allowed multi-unit residential building owners or their property managers to replace existing refrigerators older than ten years with new ENERGY STAR®-qualified units. Early in the program, Efficiency Nova Scotia Corporation (ENSC) offered rebates that varied from \$50 to \$200, depending on different aspects such as the age, efficiency and size of old refrigerators. The program delivery agent (DA) found the sliding scale to be administratively burdensome, given the fact that all but one participant received the full \$200 rebate. As a result, ENSC decided to eliminate the sliding scale and implement a flat \$200 rebate.

Even though customers were free to choose where to buy their new ENERGY STAR refrigerators, a preferred retailer, Gallery 1, was selected through a request for proposal (RFP) process. This retailer offered customers an additional rebate to the one already provided through the program.

The program collaborated with commission-based sales representatives who had generated sales leads through different landlord associations and other promotional events. A transportation service and a recycler also acted as program partners in 2011 since the units were sent to be recycled once removed and replaced by a new ENERGY STAR unit.

In 2011, a special project was held at Dalhousie University. The ARep program allowed for the replacement of existing refrigerators, freezers and mini-fridges with new ENERGY STAR-qualified units. The impact evaluation took into account this special project and calculated new unitary savings values for freezers and mini-fridges that were not covered by the program initially.

The program aimed at achieving net electricity savings of 0.96 GWh and demand savings of 0.11 MW for the year 2011.

## **KEY FINDINGS**

The program achieved the replacement of 531 refrigerators, 62 freezers and 107 mini-fridges for the year 2011. The program generated 0.548 GWh of net energy savings, which represents a significant increase in comparison to 2010 net savings (0.15 GWh), as well as in comparison to the number of units (305 refrigerators) in 2010.

## Satisfaction

The retailer partner contacted during an in-depth interview expressed a very high level of satisfaction with the overall program as well as with ENSC's team and other program partners (transport and recycling contractors). However, the former identified an improvement that would have a positive impact on program design and implementation. The retailer suggested offering participants financing. Purchasing of large quantities was not possible because payment was required prior to delivery.

## Program Energy Savings

To calculate the net savings of the ARep program in 2011, Econoler reviewed the unitary savings estimates using the metering data from the Efficient Products – Appliance Retirement (ARet) program and the theoretical energy consumption of the new models installed, based on the ENERGY STAR-qualified product list.

The results from the on-site visits revealed an installation rate of 100 percent. Moreover, the interactive effects were considered to be negligible and the NTGR was assumed to be 1.

Overall, the evaluation revealed that the ARep program had generated net energy savings of 0.548 GWh and demand savings of 0.065 MW at the generator in 2011.

**Table 1: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | NTGR        | Net Savings      |
|---------------------------|-----------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |             |                  |
| Tracked Savings from ENSC | 0.362 GWh             | 0.74        | 0.268 GWh        |
| <b>Evaluation Results</b> | <b>0.548 GWh</b>      | <b>1.00</b> | <b>0.548 GWh</b> |
| <b>Demand Savings</b>     |                       |             |                  |
| Tracked Savings from ENSC | 0.043 MW              | 0.74        | 0.032 MW         |
| <b>Evaluation Results</b> | <b>0.065 MW</b>       | <b>1.00</b> | <b>0.065 MW</b>  |

The net evaluated savings more than doubled with relation to the net evaluated savings tracked by ENSC. The upward revision of the unitary savings value for refrigerators, based on metering data from the ARet program, as well as the NTGR of 1 explain this realization rate.

## RECOMMENDATIONS

Even though the program has been discontinued for 2012, mentions of possible improvements remain relevant in the event that the program or a similar approach is conducted again in the future. Econoler finds that the program works well overall and at a satisfactory level, considering that its market is limited. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the program:

- AREP-R1. Consider offering financing:** The financing barrier to purchasing large quantities of appliances was raised through the process evaluation. It is important to have knowledge of any program barrier, such as this one, to consider the necessary actions to mitigate them as much as possible and ensure optimal success in program implementation. In that sense, ENSC could improve the availability of upfront capital from landlords.
- AREP-R2. Include a field in the tracking sheet to validate the ENERGY STAR qualification:** The tracking sheet does not include a field to validate the ENERGY STAR criterion required for the new appliances installed through the program. Econoler recommends the addition of such a field in the tracking sheet. This way, the DA will have to ensure that the installed refrigerators meet ENERGY STAR qualifications by referring to the ENERGY STAR- qualified product list. In fact, Econoler found that a few new appliances entered in the tracking sheet were not ENERGY STAR qualified. For one particular case, the nonconformity was due to a misunderstanding from the participant, because of a language barrier, and ENSC had already addressed this issue by not claiming the full savings value for these appliances. Econoler agreed with this solution but still believed that the addition of a field to validate the ENERGY STAR criterion and to identify the energy consumption of the appliance would ensure that savings are calculated correctly.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Appliance Replacement (ARep) program was launched in February 2011 and ran until the end of December 2011. It was designed to allow multi-unit residential building owners or their property managers to replace existing refrigerators with new ENERGY STAR®-qualified units. The program encouraged landlords to replace refrigerators older than ten years by providing an incentive for the removal and recycling of existing units. Early in the program, rebates varied from \$50 to \$200, depending on different aspects such as the age, efficiency and size of old refrigerators. The delivery agent (DA) found the sliding scale to be administratively burdensome, given the fact that all but one participant received the full \$200 rebate. As a result, ENSC decided to eliminate the sliding scale and implement a flat \$200 rebate. Gallery 1 was selected to be the preferred retailer for the purchase of new refrigerators through a request for proposal (RFP) process. The retailer provided a discount on ENERGY STAR refrigerators that was added to the program incentive. However, landlords could choose any retailer. The program also partnered with a transportation service and a recycler to retire old appliances.

The ARep program was designed as a market transformation and resource acquisition program. It utilized two commission-based sales representatives to generate sales leads through landlord associations like the Investment Property Owners Association of Nova Scotia (IPOANS) and the Building Owners & Managers Association (BOMA) as well as through other promotional events.

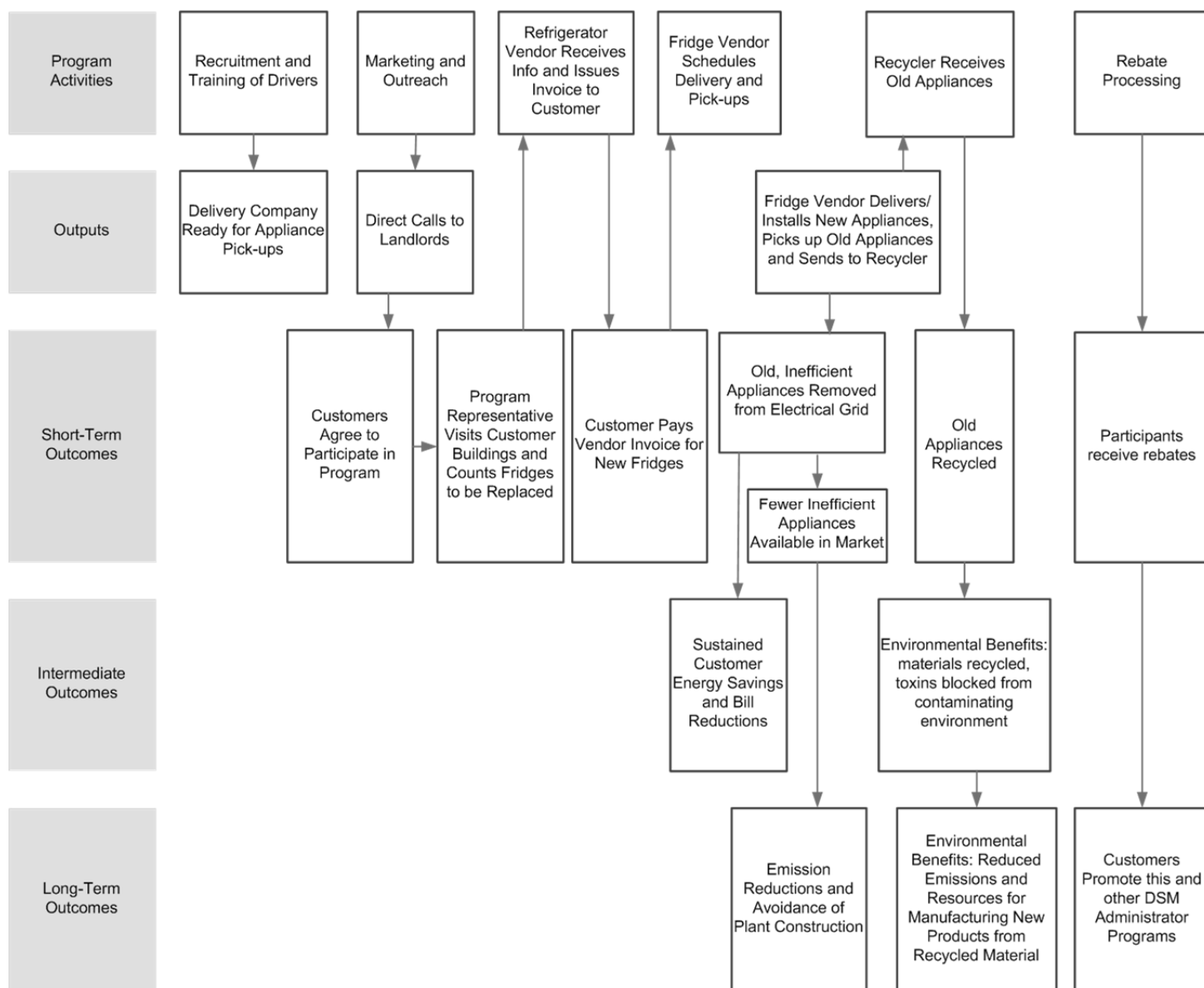
The program goal was to replace 1,500 older model refrigerators in multi-residential buildings with new ENERGY STAR appliances. After new refrigerators were delivered, the old units were removed and sent to a recycler.

Through this goal, the program aimed at achieving net electricity savings of 0.96 GWh and demand savings of 0.11 MW for the year 2011. For 2012, ENSC has decided not to pursue the ARep program due to the high cost per KWh.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Efficient Products – Appliance Replacement Program Logic Model**

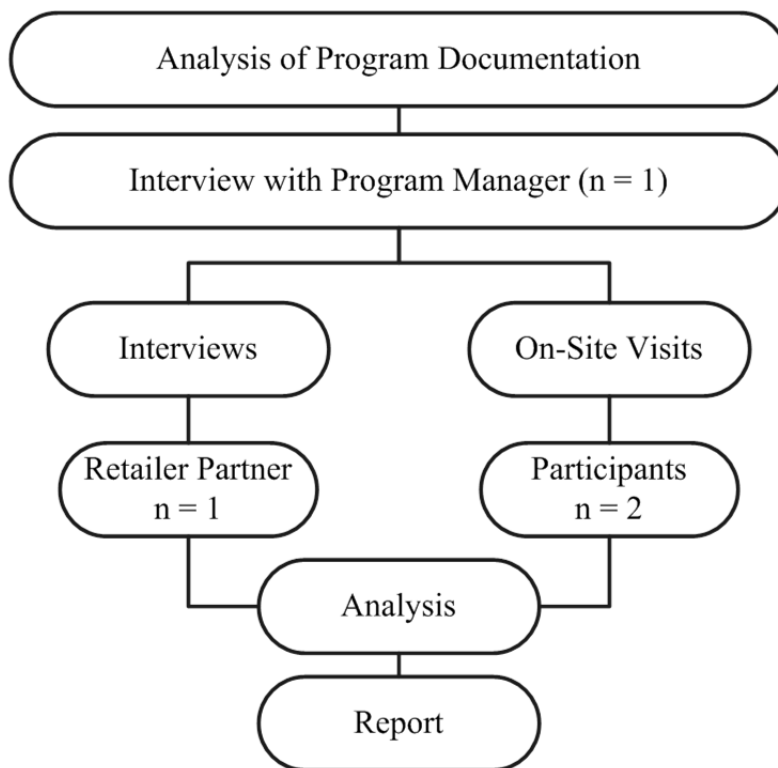


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

The figure below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides are included in Appendices II and III.

**Figure 2: Methodological Model**



## **2.2 METHODOLOGY DESCRIPTION**

### **2.2.1 Analyzing Existing Program Information**

The first task in the process evaluation of the ARep program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interview for the process evaluation was finalized.

### **2.2.3 In-Depth Interview with Program Partner**

#### **Interview with Retailer Partner**

In September, one in-depth interview was conducted with the program retailer partner. This interview was intended, among other things, to understand the retailer's involvement in the program, the company's participation process and its representative's perception and satisfaction with the program.



#### **2.2.4 On-Site Visits**

In November, two on-site visits were conducted at multi-unit residential buildings in which appliances had been replaced through the ARep program. In each multi-unit building, four apartments were visited. The visits were conducted by Econoler's subcontractor, Equilibrium Engineering. The site visits were used to validate the installation and characteristics of the new refrigerator(s) installed.

The methodology used for the on-site visits under the ARep program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix IV.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted on the ARep program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." The process evaluation relied upon in-depth interviews conducted with the PM and with the program partner (retailer).

#### 3.2 PROGRAM MANUAL CONTENT

The ARep program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what was found in the ARep program manual.

**Table 2: Program Manual Content**

| Program Manual Content                                                                                       | ARep Program Manual |
|--------------------------------------------------------------------------------------------------------------|---------------------|
| Document revisions                                                                                           | ✓                   |
| Program description (including nature or type of program)                                                    | ✓                   |
| Program justification                                                                                        | ⊘                   |
| Program objectives                                                                                           | ✓                   |
| Incentives                                                                                                   | ✓                   |
| Eligibility criteria                                                                                         | ⚠                   |
| Program partners and their roles                                                                             | ✓                   |
| Program barriers                                                                                             | ✓                   |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                   |
| Details about the savings calculations and type of measures                                                  | ✓                   |
| Budget per year                                                                                              | ✓                   |
| Cost-effectiveness test results                                                                              | ✓                   |
| Market study or technical study that supports program elements or assumptions                                | ⊘                   |
| Marketing plan                                                                                               | ⊘                   |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                     | ARep Program Manual                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                            |  |
| Program theory                                                                                                                                                                                                                                                                                                                                                             |  |
| Logic model                                                                                                                                                                                                                                                                                                                                                                |  |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                 |  |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                  |  |
| Program forms                                                                                                                                                                                                                                                                                                                                                              |  |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                                                                                     |

Econoler has consulted the ARep program manual. It contains relevant information useful for both the PM and the Evaluator. The following are recommendations in order to supplement and improve the tool, should the program be re-offered in the future:

- > **Document the major characteristic of the program:** The program manual indicates that the rebates offered depend on the age, efficiency and size of the appliance being retired. However, it does not detail the criteria for determining the rebates in each case. Moreover, the justification for deciding to select multi-residential buildings is not available in the program documents. These are major characteristics of the program and should be documented in the program manual.
- > **Provide a “base case”:** The program manual does not provide a “base case” that gives information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.
- > **Provide the parameters used to estimate the program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.

- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. The program manual content should be continually updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of the ARep tracking sheet. The information was presented in two separate sheets: one listed the customer information and the other installed refrigerator details. Each participant had a unique identification number that linked customer information to the refrigerators installed in the building and their specific characteristics. In general, the tracking sheet had a good structure that allowed the number of refrigerators installed to be monitored and maintained a good follow-up of the old refrigerators replaced.

The first sheet, which provided customer information, was useful and complete. Except for a few missing postal codes, all the customer information necessary for conducting field activities (surveys and on-site visits) was present in this sheet.

The second sheet, which provided information on the refrigerators installed, regrouped the necessary fields for program administration and evaluation purposes. It contained technical information on old and new refrigerators, such as the model number, brand and size in cubic feet. For old refrigerators, when the information on the model number or size was not accessible, it was entered as N/A in the tracking sheet. The Evaluator understands that it is not always possible to identify these details for old appliances and considers that the quantity of available information was sufficient for its analysis. For new refrigerators, the technical information entered in the tracking sheet is validated by the DA after receiving the new units installed. Most technical information on new refrigerators, particularly the model, was present in the tracking sheet. However, a few model numbers were missing which did not allow the Evaluator to validate whether the appliance installed was ENERGY STAR qualified. This verification is necessary since no specific field is included in the tracking sheet in order to specifically identify whether the refrigerators meet ENERGY STAR requirements.

The tracking sheet also contains a field that refers to the age of the unit retired. This field is essential to validate that the refrigerators replaced under the program are older than ten years, which is one of

the eligibility criteria for participating. At the time of this analysis, all refrigerators in the tracking sheet met this criterion.

To estimate the gross energy savings generated by the program, ENSC uses an average unitary savings value for all refrigerator replacements. Nonetheless, the tracking sheet does not monitor the program gross savings; it only keeps track of the quantity of each unit sold.

The program tracking sheet was also evaluated by the PM during an interview. The PM is satisfied with the tracking sheet and considers it easy to use.

Although the tracking sheet is considered relatively complete and sufficient for program monitoring, some improvements could be made to make this tool a better asset for the PM and facilitate program evaluation. Should the program be re-offered in the future, the Evaluator recommends the following:

- > **Monitor the energy savings in the tracking sheet:** The estimated gross savings should be computed in the tracking sheet. To do so, ENSC should include a field indicating the average unitary savings value estimated for each refrigerator replacement and compute the gross savings by multiplying this average value by the quantity of refrigerators replaced.
- > **Include a field to validate the ENERGY STAR qualification:** The ARep program offers a rebate for the replacement of old refrigerators with new ENERGY STAR units. However, the tracking sheet does not include a field to validate this criterion. Econoler recommends the addition of such a field in the tracking sheet. This way, the DA will have to ensure that the installed refrigerators meet ENERGY STAR qualifications by referring to the ENERGY STAR-qualified product list. In fact, Econoler found that a few new appliances entered in the tracking sheet were not ENERGY STAR qualified. For one particular case, the nonconformity could be explained through an on-site visit. It was due to a misunderstanding from the participant, because of a language barrier. ENSC had already addressed this issue and had not claimed the full savings value for these appliances. However, it did proceed with the rebate for the purpose of satisfying the customer. Econoler agreed with this solution but still believed that the addition of a field to validate the ENERGY STAR criterion would facilitate the identification of such special cases. Finally, by excluding this special case, the new appliances that did not meet the ENERGY STAR criteria represented less than 1 percent of the appliances installed. Therefore, Econoler did not apply any adjustments in the savings calculations but repeats its recommendation to include a field to validate that the ENERGY STAR criterion has been respected.
- > **Include a field to indicate the annual energy use of the new appliances installed:** Another element that could be relevant for evaluation purposes is the annual energy use. This information is available in the ENERGY STAR-qualified product list and could be easily included in the tracking sheet when validating the ENERGY STAR criterion. Such information would allow the Evaluator to register all the energy consumption of the new appliances installed, which is used in the unitary savings calculations.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, Econoler concludes that this program is well designed and had relative success considering that the target market is limited. The tracking sheet, which was notably set up in order to assess the performance of the sales representatives, contains the right performance indicators to that end. However, Econoler has identified potential means of improving program design and implementation. The following are comments and recommendations that would have a positive impact on the design and delivery of the program, should it be re-offered in the future:

- > **Consider offering financing:** ENSC needs to improve the availability of upfront capital from landlords. Indeed, the financing barrier to purchasing large quantities of appliances was raised through the process evaluation. Hence, Econoler supports the retailer's and PM's suggested option to offer a financial mechanism to overcome this barrier.
- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Focus on a resource acquisition objective:** Having a double objective of targeting resource acquisition and market transformation is always difficult to pursue. The former focuses on participants and their behaviour including free-ridership and spillover, while the latter focuses on market indicators such as penetration and market share. For this particular program, Econoler recommends that the market transformation objective not be pursued. The program is already more oriented towards an acquisition objective considering the significant rebates offered. It does not focus on mass advertising and runs with only one partner retailer, which does not facilitate the achievement of market transformation.

### **3.5 RELATIONSHIP WITH PARTNER**

The retailer's satisfaction with the overall program, the relationship with ENSC's team and other program partners (transport and recycling contractors) is very high. However, the retailer declared that there was confusion when the program changed hands from Nova Scotia Power to ENSC and that this change caused delays.

According to the retailer, there was also some confusion in the market between the Appliance Replacement program that targets multi-residential building owners and the Retail Markdown Program that offers rebates on Tier 3 appliances. The retailer explained that program representatives told him "not to restrict the Tier 3 rebates to one per fridge per household but by doing so, it actually cannibalized the multi-residential market."

To improve program performance, the retailer suggested offering participants financing. Purchasing of large quantities was not possible because payment was required prior to delivery.

The partner was also queried with respect to satisfaction with the marketing component of the program. Despite the retailer involvement in the development of the marketing component, the former was not fully satisfied in this regard, mentioning that the marketing support for this program was limited compared to other multi-residential programs.

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the ARep program for 2011. Both energy and demand savings were considered in this evaluation. To do so, Econoler reviewed the unitary savings estimated per refrigerator replaced, the installation rate, the energy-to-demand ratio and the interactive effects generated by the replacement.

The ARep program is a small component of the Efficient Products program. Its energy savings objectives correspond to only 2 percent of the total targeted by ENSC in 2011 for its Efficient Products program. For this evaluation, the number of participants was not sufficient to launch a telephone survey and evaluate a representative level of free-ridership and internal spillover. Thus, the net-to-gross ratio (NTGR) is assumed to be 1.

The impact evaluation is the result of two main activities: a review of unitary savings and on-site visits. The gross energy savings evaluation is based on a review of the unitary savings used in the 2010 evaluation. The on-site visits were used to validate the installation and the characteristics of the new refrigerators installed through the program.

#### **4.1.1 On-Site Visit Sampling and Protocol**

##### **Sampling Methodology**

Two on-site visits were conducted for the 2011 evaluation of the program. The sampling was based on program tracking sheets that contained the list of participants and information about the appliances replaced.

As only two on-site visits were planned for the ARep program, the sampling was established randomly from the tracking sheets. The criterion used in the selection was the region: the sampling targeted the regions of Halifax and Dartmouth. Two participating building owners were selected. For each, four apartments were visited. To ensure that a minimum of four visits were conducted in each building, a higher number of apartments were contacted beforehand to schedule a potential on-site visit from an evaluator. Subsequently, the first four apartments where the tenant was present were visited.



## **On-Site Visit Protocol**

For each apartment, the evaluator validated the presence of a new refrigerator and its specifications such as the model number, the size, the fact that the unit meets the ENERGY STAR qualifications or not and the annual consumption (based on manufacturer data or ENERGY STAR-qualified product list).

## **4.2 GROSS SAVINGS**

The quantity of refrigerators replaced through the program is computed in the tracking sheet. The gross savings calculation is made by using an average unitary savings value for each refrigerator replaced. ENSC estimates this value at 437 kWh, based on the 2010 ARep evaluation report.

In 2011, an important project was held at Dalhousie University. Through this project, old refrigerators, mini-fridges and freezers were replaced with new ENERGY STAR models. The unitary savings calculation for refrigerators took into account the project at Dalhousie University. For the mini-fridges and the freezers, Econoler calculated a separate unitary savings according to the data provided for this special project.

### **4.2.1 Unitary Savings Calculations**

#### **Refrigerators**

For the 2011 evaluation, Econoler reviewed the average unitary savings value of 437 kWh used by ENSC.

For old refrigerators that were replaced through the program, the 2010 evaluation report estimated an average consumption value of 906 kWh based on shipment weighted data from the Association of Home Appliance Manufacturers (AHAM) and an annual degradation factor of 1.37 percent. The AHAM provides annual energy consumption estimates for a number of appliances based on year of manufacture. Then, the average consumption value was adjusted to reflect the difference between lab-based consumption estimates and the actual consumption of the refrigerators in the field. To do so, a lab-to-on-site factor of 0.79 was applied to the average consumption value, which resulted in an adjusted average consumption value of 716 kWh for the old refrigerators replaced. This 0.79 value comes from the 2010 evaluation of the California Appliance Retirement Program for “Cool” Climate Zones and Primary Refrigerators.<sup>1</sup> The lab-to-on-site factor is different from the 0.82 value used in the

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<sup>1</sup> The Cadmus Group, Residential Retrofit – High Impact Measure Evaluation Report, Prepared for the California Public Utilities Commission – Energy Division, February 8, 2010, p.141.

Efficient Products – Appliance Retirement (ARet) program because it only accounts for primary refrigerators.

For the new refrigerators, the 2010 evaluation determined that two different types of ENERGY STAR-qualified refrigerators (GE GTH16BBXRWW and GE GTH18HBTWW) were installed under the program. Using the manufacturer-reported energy consumption of these refrigerators from the ENERGY STAR website, an average annual energy consumption of 353 kWh per year was established for new refrigerators. The lab-to-on-site factor of 0.79 was also applied to the new refrigerators, leading to final estimates of 279 kWh. Thus, the unitary savings value of 437 kWh comes from the difference between the old refrigerators' average consumption of 716 kWh and the average consumption of 279 kWh for the new ones.

For this year's evaluation, ENSC conducted a metering activity at the recycling facility to measure the energy consumption of appliances retired through the ARet program. The metering data was used to establish the average consumption value per cubic foot of 36 old refrigerators for three ranges of manufacture year. Based on the manufacture year of the old refrigerators in the ARep program tracking sheet, Econoler calculated an average annual consumption value of 58.7 kWh/cu ft for old refrigerators.

**Table 3: Metering Data for Retired Refrigerators from the Appliance Recycling Facility**

| Manufacture Year                  | Average Annual Consumption<br>per Cubic Foot<br>(kWh/cu ft) | Proportion in the ARep<br>Program Tracking Sheet<br>(%) |
|-----------------------------------|-------------------------------------------------------------|---------------------------------------------------------|
| Pre-1985                          | 84.2                                                        | 8%                                                      |
| From 1985 to 1994                 | 77.7                                                        | 10%                                                     |
| From 1995 to ...                  | 53.9                                                        | 82%                                                     |
| <b>Average Annual Consumption</b> | <b>58.7 kWh/cu ft</b>                                       |                                                         |

The average size of the old refrigerators monitored in the ARep program tracking sheet corresponds to 16.8 cubic feet. Based on this average value, Econoler calculated the average annual consumption for old refrigerators.

$$\text{Average Consumption} = 58.7 \frac{\text{kWh}}{\text{cu ft}} \times 16.8 \text{ cu ft} = 986 \text{ kWh}$$

This average annual consumption of 986 kWh will be used for the unitary savings calculation of refrigerators replaced through the program.

For the new refrigerators, Econoler used the same approach as the 2010 evaluation. Using the EnerGuide rating for the top 17 refrigerators installed under the program, it was found that the average energy consumption was 363 kWh per year. Since these models represented 89 percent of all the models installed through the program, Econoler considered reasonable to use this average annual energy consumption for new refrigerators.

The metering data of old refrigerator units already take into account the degradation of the appliances over time. Hence, no degradation factor was applied to the average consumption value calculated for old refrigerators and to the consumption value calculated for the new refrigerators since those are brand new.

The lab-to-on-site factor of 0.79 used in past evaluations was applied only to new refrigerators, leading to a final consumption value of 287 kWh. For the old refrigerators, no lab-to-on-site factor was applied to the annual consumption established from the metering data. In fact, the temperature under which the appliances were measured at the recycling facility (25°C) is similar to that found in Nova Scotia's households. The major difference between metering conditions and on-site conditions lies in the fact that the metering was conducted without accounting for door openings. The energy consumption of an appliance increases with door openings, which is directly related to the number of people in the household. Therefore, an adjustment of 1.12 was applied to the annual consumption of old refrigerators to account for the average number of people per participating household<sup>2</sup>. This adjustment is based on the occupant adjustment factor proposed in the New York protocol metering<sup>3</sup> on which was based the metering study.

**Table 4: Unitary Savings Calculation for Replaced Refrigerators**

| Parameters                                  | Values                     |
|---------------------------------------------|----------------------------|
| Base Annual Consumption – Old Refrigerators | 986 kWh × 1.12 = 1,104 kWh |
| New Annual Consumption – New Refrigerators  | 363 kWh × 0.79 = 287 kWh   |
| <b>Unitary Savings per Refrigerator</b>     | <b>817 kWh</b>             |

As a result, Econoler adjusted the unitary savings value of 437 kWh used in the tracking sheet to a value of 817 kWh. Still, these values are below the average annual consumption estimates from other studies. A study conducted for the Efficiency Maine's Appliance Replacement program found that

<sup>2</sup> According to the participant survey, the average number of people per participating household is approximately 2.5, which is consistent with the results of the 2011 socket study.

<sup>3</sup> New York Department of Public Service, Technical Resource Manual for Multifamily Replacement Refrigerators, September 29, 2010.

retired refrigerators consumed 1,824 kWh per year.<sup>4</sup> The 2010 evaluation of the California ARP found an average consumption value of 1,303 kWh across three utilities.<sup>5</sup>

At first glance, it may seem that the Evaluator has underestimated the energy consumption of retired refrigerators but there are reasons for this difference. The main reason is that the replacement program component retired primary refrigerators with an average manufacture year of 1996, whereas the evaluations referenced above included secondary refrigerators and often included refrigerators much older than those retired in the replacement program.

## Freezers

For the 2011 evaluation, Econoler calculated an average unitary savings value for the freezers replaced as part of the special project at Dalhousie University. The metering data from the ARep program was used to establish the average consumption value per cubic foot of 46 old freezers for three ranges of manufacture year. Based on the manufacture year of the old freezers replaced at Dalhousie University, Econoler calculated an average annual consumption value of 64.4 kWh/cu ft for old freezers.

**Table 5: Metering Data for Retired Freezers from the Appliance Recycling Facility**

| Manufacture Year                  | Average Annual Consumption<br>per Cubic Foot<br>(kWh/cu ft) | Proportion in the ARep<br>Program Tracking Sheet<br>(%) |
|-----------------------------------|-------------------------------------------------------------|---------------------------------------------------------|
| Pre-1985                          | 86.2                                                        | 5%                                                      |
| From 1985 to 1994                 | 80.5                                                        | 28%                                                     |
| From 1995 to ...                  | 56.0                                                        | 67%                                                     |
| <b>Average Annual Consumption</b> | <b>64.4 kWh/cu ft</b>                                       |                                                         |

The average size of the old freezers replaced in Dalhousie University corresponds to 12.7 cubic feet. Based on this average value, Econoler calculated the average annual consumption for old freezers.

$$\text{Average Consumption} = 64.4 \frac{\text{kWh}}{\text{cu ft}} \times 12.7 \text{ cu ft} = 818 \text{ kWh}$$

<sup>4</sup> NMR (2007). *Process and Impact Evaluation of the Low Income Appliance Replacement Program*. December 21, 2007.

<sup>5</sup> The Cadmus Group, *Residential Retrofit – High Impact Measure Evaluation Report*, Prepared for the California Public Utilities Commission – Energy Division, February 8, 2010, p.134.

This average annual consumption of 818 kWh will be used for the unitary savings calculation of freezers replaced through the program.

For the new freezers, Econoler used the same approach as for refrigerators. Using the manufacturer-reported energy consumption of ENERGY STAR products<sup>6</sup>, it was found that the average energy consumption of the 5 ENERGY STAR-qualified models installed in Dalhousie University was 353 kWh per year.

Since the metering data already take into account the degradation of the appliances over time, no degradation factor was applied to the average consumption value calculated for old freezers. The lab-to-on-site factor of 0.79 used in past evaluations was applied to new refrigerators, leading to a final consumption value of 279 kWh. For old freezers, the annual consumption established from the metering data was adjusted to account for door openings. As for refrigerators, an occupant adjustment factor of 1.12 was applied to the base annual consumption, leading to a final consumption value of 279 kWh.

**Table 6: Unitary Savings Calculation for Replaced Freezers**

| Parameters                             | Values                   |
|----------------------------------------|--------------------------|
| Base Annual Consumption – Old Freezers | 818 kWh × 1.12 = 916 kWh |
| New Annual Consumption – New Freezers  | 353 kWh × 0.79 = 279 kWh |
| <b>Unitary Savings per Freezer</b>     | <b>637 kWh</b>           |

As a result, Econoler applied the average unitary savings value of 637 kWh to the freezers replaced through the program.

## Mini-Fridges

A total of 86 mini-fridges were replaced through the special project in Dalhousie University. To estimate the unitary savings value associated with these replacements, Econoler used the federal standard for estimating the consumption of the old units replaced and the annual energy consumption of the new ENERGY STAR units installed.

The size of the new mini-fridges installed was 4.5 cubic feet. Based on the ENERGY STAR-qualified product list<sup>7</sup>, the average federal standard for refrigerators of 4 to 5 cubic feet corresponds to 394 kWh

<sup>6</sup> ENERGY STAR, Freezers Qualified Product List, [www.energystar.gov](http://www.energystar.gov), list posted on January 17, 2012.

<sup>7</sup> ENERGY STAR, Freezers Qualified Product List, [www.energystar.gov](http://www.energystar.gov), list posted on January 17, 2012.

per year. It is about 40 percent more than the annual energy consumption of 277 kWh per year estimated for the GE model installed through the program (model # GMR05BLPWWC). This difference meets the ENERGY STAR criterion for compact refrigerators which requires to be at least 20 percent more energy efficient than the minimum federal government standard.

The lab-to-on-site factor of 0.79, used in past evaluations, was applied to new mini-fridges, leading to a final consumption value of 219 kWh. For old mini-fridges, the annual consumption established from the metering data was adjusted to account for door openings. As for refrigerators and freezers, an occupant adjustment factor of 1.12 was applied to the base annual consumption, leading to a final consumption value of 441 kWh.

**Table 7: Unitary Savings Calculation for Replaced Mini-Fridges**

| Parameters                                 | Values                   |
|--------------------------------------------|--------------------------|
| Base Annual Consumption – Old Mini-Fridges | 394 kWh × 1.12 = 441 kWh |
| New Annual Consumption – New Mini-Fridges  | 277 kWh × 0.79 = 219 kWh |
| <b>Unitary Savings per Mini-Fridge</b>     | <b>222 kWh</b>           |

As a result, Econoler applied the average unitary savings value of 222 kWh to the mini-fridges replaced through the program.

#### **4.2.2 Installation Rate**

The on-site visits were scheduled mainly for quality assurance. A total of eight apartments were visited in two different participating multi-unit buildings to validate the installation of the new refrigerators. The on-site visits revealed that all new refrigerators had been installed in accordance with the data found in the tracking sheet. Hence, the installation rate for the ARep program is 100 percent.

The on-site visits were also used to validate that the refrigerators installed were all ENERGY STAR-qualified. In one of the two buildings inspected, Econoler found that some of the refrigerators installed did not meet ENERGY STAR qualifications. The annual consumption of these refrigerators was equal to the federal standard (479 kWh) and not 20 percent above as required by ENERGY STAR. However, ENSC explained that it was an isolated case due to a misunderstanding of the participant because of a language barrier and that it had already addressed this issue and had not claimed the full savings value for these appliances. Moreover, the Evaluator took into consideration this element in the estimation of the average annual consumption of the new refrigerators installed by including the non-ENERGY STAR model in the top 17 refrigerators installed under the program.

### 4.2.3 Energy-to-Demand Ratio

Econoler calculated the demand savings for the ARep program based on an energy-to-demand ratio of 8.49 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings by the target peak demand savings.

### 4.2.4 Revised Gross Savings

Gross energy savings for the program were revised to include the adjusted unitary savings for refrigerator replacement and the installation rate. Using the energy-to-demand ratio, the demand savings were also revised. Both results are presented in the table below.

Overall, the total gross energy and demand savings amount to 0.497 GWh and 0.059 MW at the meter. At the generator, energy and demand savings are estimated at 0.548 GWh and 0.065 MW, using a line loss factor of 1.1034. This value was estimated by assuming that the proportion of residential (61%) and commercial (39%) multi-unit residential buildings that had participated in the Efficient Products – Direct Install program was similar to that found in the ARep program. Indeed, since the participants' rate codes had not been collected for the ARep program, Econoler relied on this source of data for estimating the proportion of residential customers (meter for each renter of the multi-unit building) and commercial customers (multi-unit building with one meter for all renters) that had participated in the program. Should the program be conducted in the future, Econoler recommends to collect the participants' rate codes in order to establish the line loss factor in a more precise way.

**Table 8: Evaluation Results – Gross Energy and Demand Savings**

|                                                        | <b>Refrigerator Replacement</b> | <b>Freezer Replacement</b> | <b>Mini-Fridge Replacement</b> |
|--------------------------------------------------------|---------------------------------|----------------------------|--------------------------------|
| <b>Energy Savings</b>                                  |                                 |                            |                                |
| Number of units replaced                               | 531                             | 62                         | 107                            |
| Installation rate (%)                                  | 100%                            | 100%                       | 100%                           |
| Total number of units replaced                         | 531                             | 62                         | 107                            |
| Unitary savings (kWh)                                  | 817                             | 637                        | 222                            |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>0.434</b>                    | <b>0.039</b>               | <b>0.024</b>                   |
| Line loss factor                                       | 1.1034                          | 1.1034                     | 1.1034                         |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>0.479</b>                    | <b>0.044</b>               | <b>0.026</b>                   |
| <b>Demand Savings</b>                                  |                                 |                            |                                |
| Energy-to-demand ratio (GWh/MW)                        | 8.49                            | 8.49                       | 8.49                           |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.051</b>                    | <b>0.0047</b>              | <b>0.0028</b>                  |
| Line loss factor                                       | 1.1034                          | 1.1034                     | 1.1034                         |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.056</b>                    | <b>0.0051</b>              | <b>0.0031</b>                  |

### **4.3 INTERACTIVE EFFECTS**

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the ARep program, replacement of old refrigerators with more efficient units causes an increase in the heating load during winter and a decrease in the cooling load during summer since the condenser of an energy-efficient refrigerator releases less heat than the less efficient unit it replaces.

In Nova Scotia, the heating load period is longer than the cooling load period. Hence, the interactive effects due to the replacement of an old refrigerator by a more efficient one are expected to be negative, influencing downward the savings generated by such replacement. However, considering the various factors that affect the interactive effects, Econoler concludes that the interactive effects for the ARep program are insignificant. Indeed, Econoler took into account the following factors in its analysis:

- > Within the framework of this evaluation, the focus is on electricity savings. Hence, the negative interactive effects on the heating load only affect the households that use electricity as their primary heating source in Nova Scotia. For the ARep program, this proportion is low. In fact, 54 percent of appliances were replaced at Dalhousie University, which does not use electricity as a primary heating source. The remaining 46 percent of appliances were replaced in multi-unit buildings where only half of them (52 percent) are electrically heated.<sup>8</sup>
- > In Nova Scotia, 18 percent of households have air conditioning<sup>9</sup>. Among them, some use a heating energy source other than electricity which would result in positive interactive effects when they replace their refrigerator.
- > Several refrigerators replaced through the program are built-in or leaned against an exterior wall, which reduces the interactive effects generated by the refrigerator replacement.

Due to these elements, the interactive effects for the ARep program are assumed to be null.

### **4.4 NET-TO-GROSS RATIO**

The NTGR calculation is usually based on a self-report approach which relies on a series of questions asked to program participants during a telephone survey. These questions are designed to measure the distortion effects associated with the program such as free-ridership and internal spillover.

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<sup>8</sup> From the 2011 socket study conducted by CRA with 1,004 households of Nova Scotia.

<sup>9</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.



As mentioned earlier, the number of participants to the ARep program in 2011 was not sufficient to justify a telephone survey and evaluate a representative level of free-ridership and internal spillover. Thus, the NTGR for this program is assumed to be 1.

## 4.5 NET SAVINGS

The net energy savings are estimated by adding the interactive effects and the NTGR to the gross savings, based on the equation below.

$$\text{Net Energy Savings} = \text{Gross Energy Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

In the case of the ARep program, the equation is simplified since the interactive effects are assumed to be null and the NTGR is assumed to be 1.

Overall, the total net energy and demand savings amount to 0.497 GWh and 0.059 MW at the meter, and 0.548 GWh and 0.065 MW at the generator.

**Table 9: Evaluation Results – Net Energy and Demand Savings**

|                            | Energy Savings (GWh) |                  | Demand Savings (MW) |                  |
|----------------------------|----------------------|------------------|---------------------|------------------|
|                            | At the Meter         | At the Generator | At the Meter        | At the Generator |
| Total Gross Savings        | 0.497                | 0.548            | 0.059               | 0.065            |
| Interactive Effects Factor | 0%                   | 0%               | 0%                  | 0%               |
| NTGR                       | 1.00                 | 1.00             | 1.00                | 1.00             |
| <b>Total Net Savings</b>   | <b>0.497</b>         | <b>0.548</b>     | <b>0.059</b>        | <b>0.065</b>     |

The energy and demand savings resulting from this evaluation were compared to the savings from the 2011 tracking sheet, as shown in the table below.

**Table 10: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | NTGR        | Net Savings      |
|---------------------------|-----------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |             |                  |
| Tracked Savings from ENSC | 0.362 GWh             | 0.74        | 0.268 GWh        |
| <b>Evaluation Results</b> | <b>0.548 GWh</b>      | <b>1.00</b> | <b>0.548 GWh</b> |
| <b>Demand Savings</b>     |                       |             |                  |
| Tracked Savings from ENSC | 0.043 MW              | 0.74        | 0.032 MW         |
| <b>Evaluation Results</b> | <b>0.065 MW</b>       | <b>1.00</b> | <b>0.065 MW</b>  |

The net evaluated savings more than doubled with relation to the net evaluated savings tracked by ENSC. This result is mainly due to the revision of the unitary savings value for refrigerators. Using the metering data from the ARet program, Econoler adjusted the unitary savings value of 437 kWh, used in the tracking sheet, to a value of 817 kWh.

Other parameters remained the same as in the tracking sheet:

- > The installation rate was measured during on-site visits. In the two buildings visited, it was found that 100 percent of the refrigerators surveyed were installed.
- > No interactive effects were taken into consideration in the tracking sheet. Econoler evaluated these potential effects on the heating and cooling consumptions of homes and concluded that they were negligible.
- > The NTGR is assumed to be 1. Due to the low number of participants for the ARep program, the evaluation did not include the assessment of free-ridership and spillover effects.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Document the major characteristic of the program:</b> The program manual indicates that the rebates offered depend on the age, efficiency and size of the appliance being retired. However, it does not detail the criteria for determining the rebates in each case. Moreover, the justification for deciding to select multi-residential buildings is not available in the program documents. These are major characteristics of the program and should be documented in the program manual.                                                                                                                                                                                                                                                                                                          |
|                               | <b>2. Provide a “base case”:</b> The program manual does not provide a “base case” that gives information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                                   |
|                               | <b>3. Provide the parameters used to estimate the program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |
|                               | <b>4. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>5. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. The program manual content should be continually updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Program Tracking Sheet</b> | <p><b>6. Monitor the energy savings in the tracking sheet:</b> The estimated gross savings should be computed in the tracking sheet. To do so, ENSC should include a field indicating the average unitary savings value estimated for each refrigerator replacement and compute the gross savings by multiplying this average value by the quantity of refrigerators replaced.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               | <p><b>7. Include a field to validate the ENERGY STAR qualification:</b> The AREP program offers a rebate for the replacement of old refrigerators with new ENERGY STAR units. However, the tracking sheet does not include a field to validate this criterion. Econoler recommends the addition of such a field in the tracking sheet. This way, the DA will have to ensure that the installed refrigerators meet ENERGY STAR qualifications by referring to the ENERGY STAR-qualified product list. In fact, Econoler found that a few new appliances entered in the tracking sheet were not ENERGY STAR qualified. For one particular case, the nonconformity could be explained through an on-site visit. It was due to a misunderstanding from the participant, because of a language barrier. ENSC had already addressed this issue and had not claimed the full savings value for these appliances. However, it did proceed with the rebate for the purpose of satisfying the customer. Econoler agreed with this solution but still believed that the addition of a field to validate the ENERGY STAR criterion would facilitate the identification of such special cases. Finally, by excluding this special case, the new appliances that did not meet the ENERGY STAR criteria represented less than 1 percent of the appliances installed. Therefore, Econoler did not apply any adjustments in the savings calculations but repeats its recommendation to include a field to validate that the ENERGY STAR criterion has been respected.</p> |
|                               | <p><b>8. Include a field to indicate the annual energy use of the new appliances installed:</b> Another element that could be relevant for evaluation purposes is the annual energy use. This information is available in the ENERGY STAR-qualified product list and could be easily included in the tracking sheet when validating the ENERGY STAR criterion. Such information would allow the Evaluator to register all the energy consumption of the new appliances installed, which is used in the unitary savings calculations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Design and Implementation</b> | <p><b>9. Consider offering financing:</b> ENSC needs to improve the availability of upfront capital from landlords. Indeed, the financing barrier to purchasing large quantities of appliances was raised through the process evaluation. Hence, Econoler supports retailer and PM's suggested option to offer a financial mechanism to overcome this barrier.</p>                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                          | <p><b>10. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> |
|                                          | <p><b>11. Focus on a resource acquisition objective:</b> Having a double objective of targeting resource acquisition and market transformation is always difficult to pursue. The former focuses on participants and their behaviour including free-ridership and spillover, while the latter focuses on market indicators such as penetration and market share. For this particular program, Econoler recommends that the market transformation objective not be pursued. The program is already more oriented towards an acquisition objective considering the significant rebates offered. It does not focus on mass advertising and runs with only one partner retailer, which does not facilitate the achievement of market transformation.</p>                                 |
| <b>Impact Evaluation</b>                 | <p><b>12. Keep track of the participants' rate codes:</b> Since the participants' rate codes had not been collected for the ARep program, Econoler relied on the ARet program data for estimating the proportion of residential customers (meter for each renter of the multi-unit building) and commercial customers (multi-unit building with one meter for all renters) that had participated in the program. Should the program be re-offered in the future, Econoler recommends to collect the participants' rate codes in order to establish, in a more precise way, the line loss factor.</p>                                                                                                                                                                                 |

## **APPENDIX II - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Appliance Replacement Program**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

#### **Page 24**

Q: Are you tracking the participants who received more than your subsidy, like the one from Gallery 1? Motivation could be different between 200\$ and 400\$.

#### **Page 25**

Q: Who is the delivery agent and how many are they? Is it the vendor (in the logic model it shows that he is responsible for delivery, installation of new appliance, pick-up old appliance and sends it to recycle?

Q: Please provide us with a short description of the roles of your partners and how you call them in this program in order to help us asking the proper questions for the process interview with them.

Q: As far as you know, is the relationship between the landlord and tenant concerning who pays the electricity bill is still a barrier? If yes are you doing anything about it?

Q: what is the performance of the two commissions based sales leads so far? Do you track their work with any performance indicators? If yes what are they?

#### **Page 26**

Q: To your knowledge the upfront capital for landlords is still a barrier? If yes are you doing anything about it?

**Page 27**

C: Reaching market transformation as a program objective through a resource acquisition program could be a very difficult task. To be discussed with PM.

Q: Do you have the source and detail related to the 1608 kWh for the old fridge (this is without degradation factor) so in theory it should be higher?

**Page 59**

C: In figure 2-2 we think that the bubble "Participant Receive Rebates" should be in the short-term outcome and not intermediate outcome.

**Source: Website : No questions**

|                                |
|--------------------------------|
| <b>Source: 2010 Evaluation</b> |
|--------------------------------|

**Page 1**

Q: The program has changed names several times (Pull the plug, Appliance and Replacement program (ARR) , did you notice any confusion in the market?

Q: What is the rationale, or why did you select multi-residential buildings for this program?

**Page 51- ARR-F13**

Q: The 2010 evaluation interviewed only one participant?

ARR-R14

Q: What is the status on the delays (even though its only one respondent)?

ARR-F16

Q: Could you explain what the evaluator means by the spilt incentive? Is it still a barrier and what are you doing about it?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Did the program design foresee any distortion effects (free-riders, spill-over, interactive effects, etc.)?

Q: Do you perform a post-cost effectiveness test after each evaluation? And if not why?

Q: Was there an evaluation plan when this program was first designed?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

Thank you very much for your time and cooperation.



## **APPENDIX III - INTERVIEW GUIDE WITH RETAIL PARTNER**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Appliance Replacement Program (ARep)**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, save the file and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca)

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was the complaint about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Appliance Replacement Program**

**Q9 – We would like your opinion on the number of parties involved in this program (delivery agent, recycler, transport contractor).**

**Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 5 (where 1 is very bad and 5 is excellent), how would you rate your relationship with the other partners in this program?**

**Delivery Agent**

**Score:**

**Transport Contractor**

**Score:**

**Recycler Contractor:**

**Score:**

**Q10a – If any of your answers to Q10 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participants?**

**Q12- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Q13- What is your opinion in regard to the program name that has changed many times since its first implementation (from Appliance Retirement and Replacement Program to "Pull the Plug" Program to Appliance Retirement Program)?**

**Q14- What is your opinion in regard to program on-course modifications (other than the change of program name)?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

☐ Not Applicable

**Q15- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q15a- What was the complaint about?**

**Q16 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## APPENDIX IV - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Order ID: \_\_\_\_\_

Site contact name: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

### 2 APPLIANCE INFORMATION

*Validate the database information with the site contact:*

| Appliance      | Total Number of Units Replaced | Date of Replacement   |
|----------------|--------------------------------|-----------------------|
| Refrigerators: | <i>To be competed</i>          | <i>To be competed</i> |

#### Refrigerator Information (*on-site observation or on manufacturer's website*)

**Unit #1:** \_\_\_\_\_ *To be competed*

New or used unit?:

Brand:

Model number:

Capacity [in cubic feet]:

Smaller, bigger or same size as the retired unit:

*(site contact declaration)*

Energy consumption [kWh/year]:

ENERGY STAR rating:

**Refrigerator Information (on-site observation or on manufacturer's website)**

**Unit #2:** \_\_\_\_\_ *To be completed*

New or used unit?: \_\_\_\_\_

Brand: \_\_\_\_\_

Model number: \_\_\_\_\_

Capacity [in cubic feet]: \_\_\_\_\_

Smaller, bigger or same size as the retired unit: \_\_\_\_\_ *(site contact declaration)*

Energy consumption [kWh/year]: \_\_\_\_\_

ENERGY STAR rating: \_\_\_\_\_

**Unit #3:** \_\_\_\_\_ *To be completed*

New or used unit?: \_\_\_\_\_

Brand: \_\_\_\_\_

Model number: \_\_\_\_\_

Capacity [in cubic feet]: \_\_\_\_\_

Smaller, bigger or same size as the retired unit: \_\_\_\_\_ *(site contact declaration)*

Energy consumption [kWh/year]: \_\_\_\_\_

ENERGY STAR rating: \_\_\_\_\_

**Unit #4:** \_\_\_\_\_ *To be completed*

New or used unit?: \_\_\_\_\_

Brand: \_\_\_\_\_

Model number: \_\_\_\_\_

Capacity [in cubic feet]: \_\_\_\_\_

Smaller, bigger or same size as the retired unit: \_\_\_\_\_ *(site contact declaration)*

Energy consumption [kWh/year]: \_\_\_\_\_

ENERGY STAR rating: \_\_\_\_\_





# **EFFICIENT PRODUCTS – RETAIL MARKDOWN PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Retail Markdown Program (RMP). The 2011 evaluation was based on in-depth interviews with the Program Manager (PM), one delivery agent (DA) and five retailer partners, 10 on-site visits of retailer stores as well as telephone surveys (71 program participants and 70 non-participants).

## **PROGRAM OVERVIEW**

In 2011, the RMP, also known on the market as “Plug Into Savings,” worked in collaboration with 12 major retail chains and independent retailers across Nova Scotia (NS) to offer customers in-store discounts on different energy-efficient products.

Discounts were offered on the following products:

- > multipacks of ENERGY STAR® regular compact fluorescent lamps (CFLs);
- > any size packages of ENERGY STAR specialty CFLs;
- > LED lamps;
- > dimmer switches;
- > indoor and outdoor motion sensors;
- > power bars with integrated timer;
- > heavy duty outdoor timers;
- > programmable thermostats for baseboard heaters;
- > CEE Tier 3 refrigerators; and
- > CEE Tier 3 clothes washers.

The spring and fall retail markdown periods for the year 2011 ran from May 1 to June 30 and from October 1 to December 18, respectively.

In 2011, the program also included an Air Miles pilot project, which rewarded participants with Air Miles when purchasing eligible CFLs, refrigerators and clothes washers. The program held in-store weekend events as well, during which participants were given information about the program along with free specialty CFLs as part of ENSC representative giveaways.

The RMP is both a resource acquisition and a market transformation program operating in a market that is partially transformed for regular CFLs. The long-term market transformation goal is not simply the adoption of CFLs by homes in NS, but also the use of CFLs in all available sockets. From a resource acquisition perspective, the goal is achieved when customers install program CFLs in sockets previously used by lower efficiency technologies.

The program aimed at achieving net energy savings of 15.52 GWh and demand savings of 1.56 MW at the generator for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the RMP demonstrated that the program constitutes the right approach in a market transformation and resource acquisition perspective. The incidence of program participants in the population was 37 percent in 2011, slightly higher than in 2010 (31 percent). In terms of net energy savings at the generator, the program generated 13.802 GWh, which represents an increase in comparison to 2010 net savings (10.36 GWh).

### **Awareness and Marketing**

Survey results showed that program awareness had dropped among participants and non-participants in 2011 compared to 2010. Indeed, fewer participants and non-participants recalled seeing in-store promotions during the two markdown periods. The same observation was made regarding the discount offering. This could be partially due to decreased recognition of ENSC versus NSPI among customers. ENSC, being a new organization, does not yet enjoy a strong corporate brand on which marketing campaigns can rely. The relatively low level of promotion and discount awareness is also consistent with information collected during the in-store visits. The mystery shoppers noticed that the promotional display was sometimes disheveled and felt a lack of organization. Consequently, the clients who did not know about the program, and even the ones who did, had difficulty identifying discounted products. These findings revealed an issue regarding the program marketing material.

The DA contacted during an in-depth interview identified the marketing material as the main program barrier. They recommended optimizing marketing material and tactics in preparation for in-market periods. Indeed, they related retailers' concern with changing product categories or discounts a few weeks before in-market periods as well as with their negative feedback on specific marketing materials. These concerns were confirmed by retailers during in-depth interviews as they mentioned that they wished to be informed in advance of all promotions and events to come or of changes made to the program. This should be less of an issue in 2012 though considering that ENSC will conduct a 10-month campaign instead of holding the event over two two-month periods. However, the implementation of marketing material will still need to be closely watched in order for the campaign to reach customers. The retailers also suggested rethinking the marketing material for it to be more customer-oriented, meaning that it should be more "eye-catching," yet still informative.

The retailers also highlighted the relevance, importance and positive impact of the weekend events on their sales and on the consumers' knowledge of energy efficiency. All the retailers interviewed preferred a two-month discount period to a year-round promotion period. Some retailers even recommended turning the markdown periods into weekend events to drive traffic and create an urgency to buy. Even though ENSC will conduct a 10-month campaign in 2012 instead of holding the event over two retail markdown periods, retailers will be pleased to know that a marketing pulse approach is concurrently being developed. It will be important to maintain this initiative to preserve the



strength of the relationship with the participating retailers and to create an interest among customers pushing them to buy.

On a different note, survey results revealed that a large proportion of customers are aware of CFLs that are glass tubes bent into a spiral. However, the familiarity with specialty CFLs is much lower. ENSC has acknowledged this information and has already deployed efforts to improve the awareness of the population towards specialty CFLs, notably through in-store weekend events. This approach should be maintained in 2012.

## **Satisfaction**

In spite of the concerns mentioned above, the DA interviewed also indicated being satisfied with the program overall as well as with their relationship with the participating retailers and ENSC's team. Likewise, the retailers provided high satisfaction ratings with regard to the program in general and most of its aspects such as their relationship with the DA, the amounts of the discounts, discount processing as well as discount tracking and reporting.

## **Residual Potential**

Survey results demonstrated that the installation rate for CFLs was rather high among non-participants. Just under nine in 10 non-participants currently use CFLs in their home and have an average of 13.9 CFLs installed. In spite of that relatively high number of CFLs installed, there remains a residual potential to be bridged for CFLs since a socket study conducted in 2011 by ENSC across Nova Scotia indicated an average of 36 sockets per household.

## **Program Energy Savings**

The impact evaluation is the result of three main activities: a review of unitary savings used to estimate gross savings, the CFL-buyer participant survey and retailer interviews. To calculate the gross and net savings, Econoler took into consideration the replacement ratio and in-service rate of regular CFLs, the interactive effects for lighting products as well as free-ridership and spillover through market effects for three important products: regular CFLs, refrigerators and clothes washers. The table below shows the net-to-gross ratio (NTGR) calculated from the free-ridership and spillover levels captured for these three products. For all other products, a NTGR of 1 was used since the population of buyers for these products was too small to reach a sufficient number of participants through a general population telephone survey. Another reason explaining the NTGR of 1 lies in the fact that these products are grouped into too large retail categories to allow retailers to estimate the program influence on their sales.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                                                   | Regular CFLs | Refrigerators | Clothes Washers | Other Products |
|---------------------------------------------------|--------------|---------------|-----------------|----------------|
| Free-Ridership Level                              | 78%          | 17%           | 53%             | -              |
| Spillover Level (measured through market effects) | 31%          | 30%           | 32%             | -              |
| Net-to-Gross Ratio                                | 0.53         | 1.13          | 0.79            | 1.00           |

The evaluation revealed that the RMP had generated net energy savings of 13.802 GWh and demand savings of 1.388 MW at the generator in 2011. These results include the savings from the products sold during both markdown periods, from the specialty CFLs given away during in-store weekend events and from the products sold through the Air Miles pilot project.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR        | Net Savings       |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|-------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                   |
| Tracked Savings from ENSC | 16.799 GWh            | 16.799 GWh              | 16.799 GWh                                       | 1.06        | 17.821 GWh        |
| <b>Evaluation Results</b> | <b>22.555 GWh</b>     | <b>19.752 GWh</b>       | <b>17.346 GWh</b>                                | <b>0.80</b> | <b>13.802 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                   |
| Tracked Savings from ENSC | 1.690 MW              | 1.690 MW                | 1.690 MW                                         | 1.06        | 1.793 MW          |
| <b>Evaluation Results</b> | <b>2.269 MW</b>       | <b>1.987 MW</b>         | <b>1.745 MW</b>                                  | <b>0.80</b> | <b>1.388 MW</b>   |

These net evaluated savings fell short of those tracked by ENSC. The main element that explains this result is the difference between the NTGR used for the evaluation and that used in the tracking sheet, which was based on the 2010 evaluation and estimated above 1. Moreover, the inclusion of a replacement ratio and an in-service rate for regular CFLs as well as interactive effects for lighting products allowed for a more precise evaluation of savings. Finally, for several products, Econoler revised upward the unitary savings value, as summarized in the table below.

**Table 3: 2011 Program Unitary Savings Adjustments**

| Products                         | Unitary Savings Values (kWh/year) |           |
|----------------------------------|-----------------------------------|-----------|
|                                  | Tracked                           | Evaluated |
| Regular and Specialty CFLs       | 41                                | 49.8      |
| LED Lamps                        | 8.75                              | 41.7      |
| Dimmer Switches                  | 23.65                             | 23.65     |
| Indoor Motion Sensors            | 63.95                             | 63.95     |
| Outdoor Motion Sensors           | 159.38                            | 159.38    |
| Power Bars with Integrated Timer | 53                                | 53        |
| Heavy Duty Timers                | 383.65                            | 383.65    |
| Programmable Thermostats         | 63.15                             | 223       |
| CEE Tier 3 Refrigerators         | 112.8                             | 230       |
| CEE Tier 3 Clothes Washers       | 242                               | 469       |

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- RMP-R1. Review marketing material and in-store display to increase program awareness:** Survey results, in-store visits and partner interviews all indicate that program marketing and advertising is the one aspect that leaves the most room for improvement. Considering all data collected, it seems that the problem resides in both the design and the implementation of the program marketing material. Improvements need to be made in order for program awareness to increase among participants and non-participants. To that effect, the present recommendation is divided into two components. The first part of the recommendation aims at improving the appearance of the marketing material by keeping it informative while making it more appealing to consumers in order to really capture their attention. The second part of the recommendation specifically targets collaboration with the retailers. A lack of organization in the presentation of the marketing material was observed as part of many in-store visits. To resolve that issue, Econoler recommends providing retailers with more help with the installation of the marketing material. As brought up by the retailers, ENSC's sales representatives could visit the stores before the markdown periods to assist the staff in the preparation to launch the program by making sure that all marketing tools are well installed. This

approach would guarantee that the marketing and advertising are optimal. It would inform customers of the existence of the program and guide them towards eligible products, which in turn should reduce the free-ridership level.

**RMP-R2. Consider conducting exit surveys:** The challenge of the Evaluator for such a program lies in the fact that participants are unknown and it is necessary to survey a large number of consumers to find an adequate sample of participants. Even then, a portion of these participants may be unaware or have forgotten that there was a discount in their purchase, making the mass survey an imprecise tool for monitoring the market. An exit survey, which usually consists of in-store intercept interviews with people who have just completed their purchases, could solve part of this problem. Interviewing participants right after their purchase could result in a lower free-ridership level since participants will have better recollection of the discount offered and the level of influence it had on their purchase. Moreover, other relevant information for the impact evaluation could be assessed during these exit surveys. For instance, an exit survey targeting thermostat buyers would allow collecting information on the housing type and the main source of energy they use.

**RMP-R3. Increase the number of retailer interviews planned for the evaluation:** During retailer interviews, Econoler noticed that the program had not only influenced the participants with the discount but had also influenced other aspects of the market that consumers did not necessarily perceive and attribute to the program. Indeed, retailers declared that the program had influenced their in-store offer, the awareness of salesperson and product availability, all in favor of more energy-efficient products. By increasing the number of retailer interviews, it would be possible to capture and quantify more precisely all these indirect influences on the market. Moreover, it could allow estimating spillover through market effects for other products that were not targeted during this evaluation.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Efficiency Nova Scotia Corporation (ENSC) Retail Markdown Program (RMP) is both a resource acquisition and a market transformation program operating in a market that is partially transformed for regular Compact Fluorescent Lamps (CFLs). In 2008, 2009 and 2010, non-participant homes had an average of 11, 13 and nearly 14 CFLs, respectively. A socket study conducted in 2011 indicates that households in Nova Scotia (NS) have an average of 36 sockets, of which an average of 16 contain CFLs.

The long-term market transformation goal is not simply the partial adoption of CFLs by homes in NS; it is the use of CFLs in all available sockets. From a resource acquisition perspective, as long as customers install program CFLs in sockets previously used by lower efficiency technologies, the goal has been achieved.

Research conducted by ENSC prior to designing the RMP revealed high CFL usage in the province. In this regard, 80 percent of residential customers said that they used CFLs. Therefore, the RMP aimed to encourage customers to “think beyond the mini-twister” and learn that there were specialty CFL bulbs for almost every application in the household. Throughout 2008 and 2009, the program utilized partnerships established with retailers across Nova Scotia to offer discounts on multipacks containing four or more ENERGY STAR®-qualified CFLs and any size package containing ENERGY STAR-qualified specialty CFL bulbs.

In 2010, the RMP offered discounts on any size package containing ENERGY STAR-qualified CFLs and ENERGY STAR-qualified specialty CFL bulbs. Moreover, the RMP expanded to offer incentives on ENERGY STAR-qualified lighting fixtures, electronic programmable thermostats for electric baseboard heaters, power bars with integrated timer, dimmer switches and indoor/outdoor timers. ENERGY STAR-qualified refrigerators and clothes washers were discounted as well.

The 2011 program continues to offer discounts on these products to a growing list of retailers. However, due to high market saturation of ENERGY STAR-qualified appliances, only CEE Tier 3 appliances are included. Changes were also made on CFL products, in that discounts are now offered on multipacks containing four or more ENERGY STAR-qualified CFLs instead of on any size packages. Finally, ENERGY STAR-qualified light fixtures<sup>1</sup> are not part of the discounted products in 2011. The program features the following efficient products with a distinct discount for each of them.

---

<sup>1</sup> ENERGY STAR lighting fixtures are energy-efficient lighting fixtures fitted with a specific socket tube that generally uses what we call pin-based CFLs, similar to a fluorescent for example. Except for motion sensors, it is not possible to insert standard screw-in light bulbs in these fixtures.

**Table 4: List of Discounts per Product**

|                                                                       |                                                                              |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>\$3 on ENERGY STAR Regular CFLs</b><br>(multipacks of 4 or more)   | <b>\$4 on Power Bars with Integrated Timer</b>                               |
| <b>\$3 on ENERGY STAR Specialty CFLs</b><br>(single or double packs)  | <b>\$10 on Heavy Duty Outdoor Timers</b><br>(plug-in)                        |
| <b>\$5 on ENERGY STAR Specialty CFLs</b><br>(multipacks of 3 or more) | <b>\$10-\$30 on Programmable Thermostats for</b><br><b>Baseboard Heaters</b> |
| <b>\$5 on LED Lamps</b>                                               | <b>\$100 on Select CEE TIER 3 Refrigerators</b>                              |
| <b>\$3 on Dimmer Switches</b><br>(hard-wired)                         | <b>\$100 on Select CEE TIER 3 Washers</b>                                    |
| <b>\$3 on Indoor and Outdoor Motion Sensors</b><br>(hard-wired)       |                                                                              |

The ENSC RMP held two two-month events in 2011. The in-market periods ran from May 1 to June 30, 2011 and from October 1 to December 18, 2011. Summerhill Group was the delivery agent responsible for program implementation. The program is known in the market as “Plug Into Savings.” Moreover, weekend events were held in participating retail stores during the markdown periods. These activities aimed at providing information about the program and involved specialty CFL giveaways.

A pilot project was added to the program activities in 2011: the Air Miles pilot project. Through this project, participants were rewarded with Air Miles when purchasing some of the RMP products. For example, participants received a minimum of five Air Miles per ENERGY STAR CFL package. Furthermore, Whirlpool dealers offered 200 Air Miles on CEE Tier 3 refrigerators and clothes washers. It is to be noted that the 2011 RMP process evaluation does not include the Air Miles pilot project. However, energy savings generated by that pilot were considered in the impact evaluation.

Participating stores include 12 major retail chains with more than 200 locations across Nova Scotia. In addition to these locations, independent retailers participated in the program. All retailers that participated in 2010 also participated in 2011, except for Walmart, whose participation was limited to the spring period only. In 2011, two additional retailers joined the RMP: Future Shop and Atlantic Superstore.

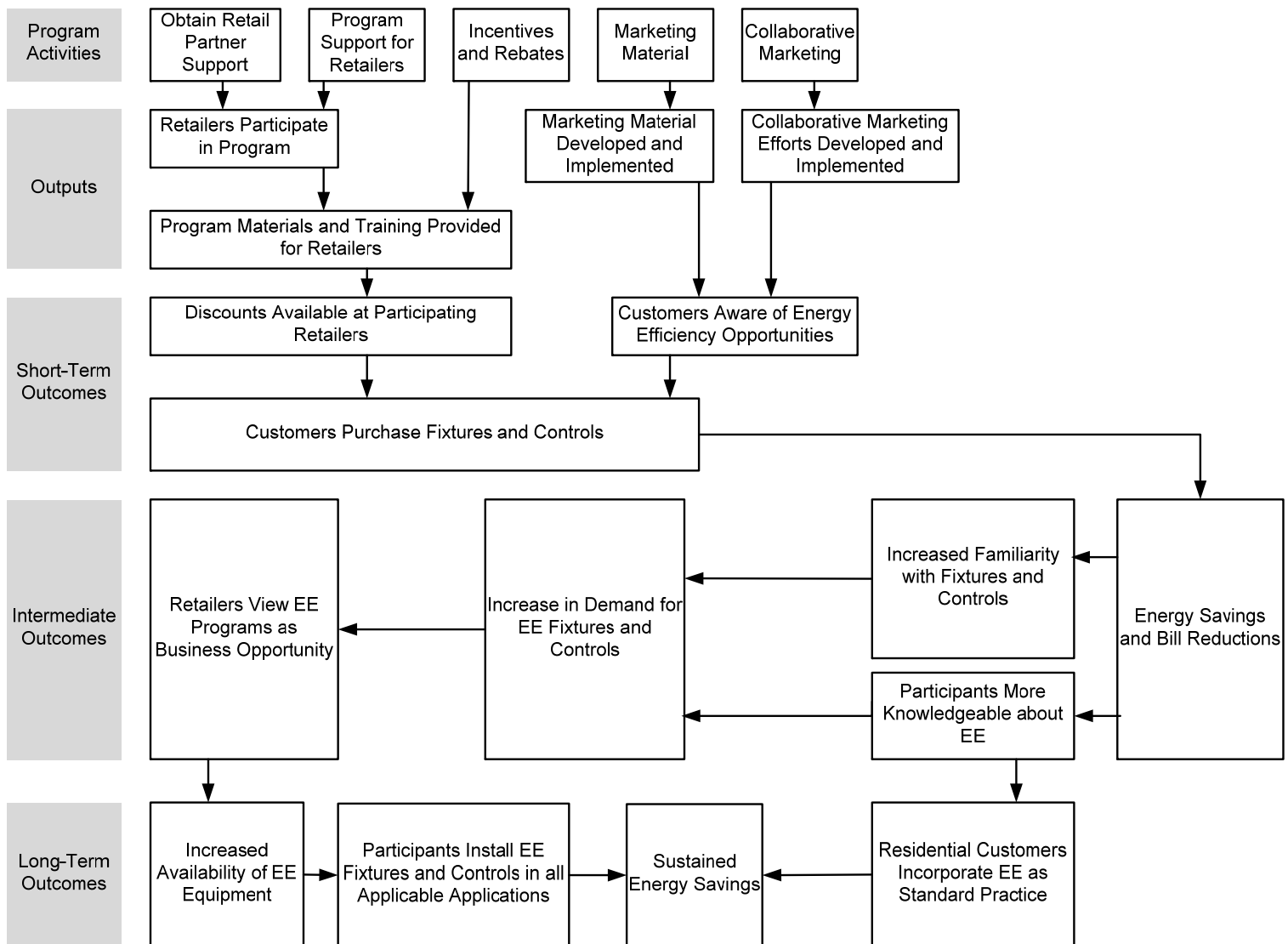
The program was promoted through in-store signage, flyers, store circulars, direct mail, radio spots, public transit ads, information provided on the ENSC website, associate training, associate contests and in-store events to educate and engage the public. Educating participants about energy efficiency has been found to be an important focus of the program. To accomplish this, the delivery agent conducted customer engagement events throughout the delivery period.

The program aimed at achieving net electricity savings of 15.52 GWh and demand savings of 1.56 MW for the year 2011. In 2010, the RMP program generated net energy savings of 10.36 GWh.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Efficient Products – Retail Markdown Program Logic Model**

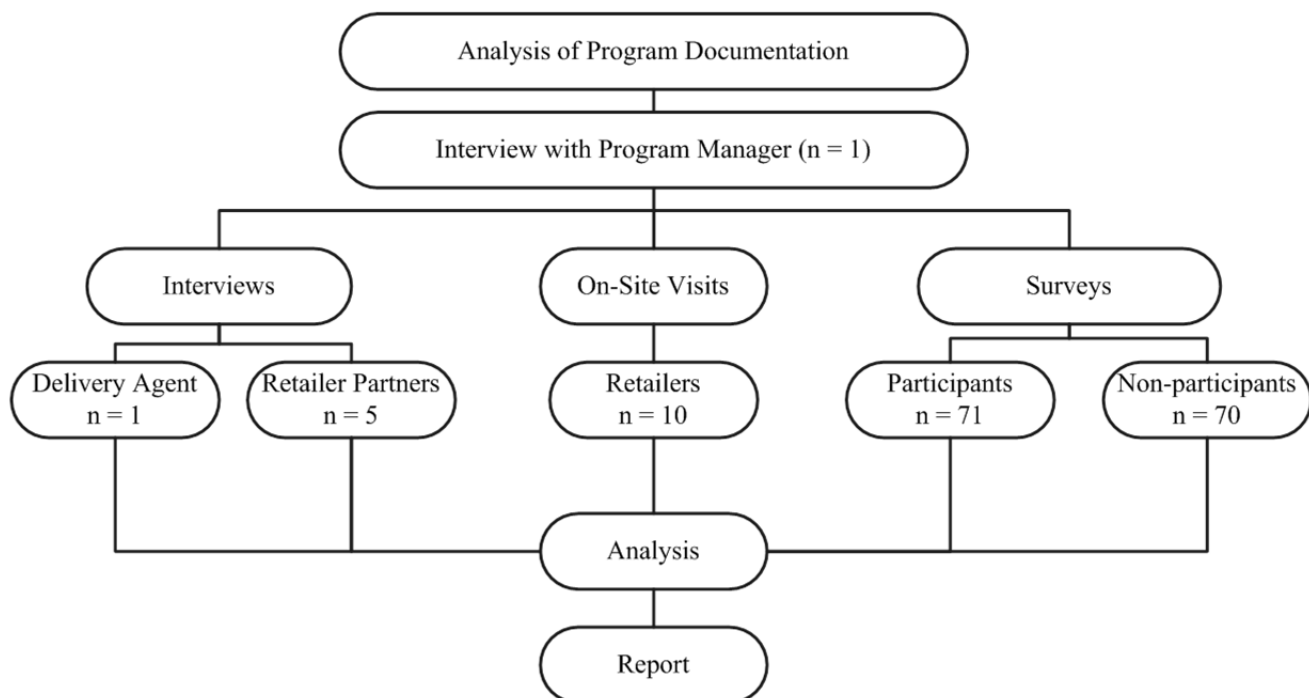


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices III, IV, V and VI.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the RMP was the analysis of the program documentation. At that stage, key program information was reviewed. The information used to conduct this analysis was obtained primarily from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;



- > program promotional material; and
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results from the PM interview, it was possible to finalize the list of questions and topics to include in the program partner interviews for the process evaluation.

### **2.2.3 In-Depth Interviews with Program Partners**

#### **Interview with Delivery Agent**

In September, one in-depth interview was conducted with the program delivery agent. This interview was intended, among other things, to understand the delivery agent's involvement in the program, their participation process in the program and their perception and satisfaction with the program.

#### **Interviews with Retailers**

In November, six in-depth interviews were conducted with program retailers. These interviews were used to establish the distortion effects for three specific products: CFLs, CEE Tier 3 ENERGY STAR refrigerators and clothes washers. Free-ridership for refrigerators and clothes washers as well as spillover (through market effects) for all three products were evaluated by using the retailer interviews. The interviews also aimed at understanding the process the retailers underwent as part of their participation in the program and their perception and satisfaction with the program.

## **2.2.4 On-Site Visits**

During the months of October and November, 10 on-site visits were conducted at retailer stores that had participated in the RMP. The visits were conducted by Econoler's subcontractor, Equilibrium Engineering. These visits and observations were designed to provide the qualitative information required to depict the in-store experience of the client. These "mystery shopper" visits and observations allowed for an assessment of the efficiency of the instant discounts awarded at the counter, the product promotional displays and the knowledge of products and the program by the employees. A copy of the "mystery shopper" visit protocol is included in Appendix VII.

## **2.2.5 Participant and Non-Participant Surveys**

The 2011 evaluation of the RMP involved telephone surveys with program participants and non-participants. Seventy-one program participants and 70 non-participants were identified through telephone screening based on self-reported CFL purchases during the two active program periods.

The following criteria were used to identify likely program participants:

- > They reported being familiar with CFLs after being read a description of the bulbs.
- > They reported purchasing CFLs during either program period (between October 1st and December 17th or between May 1st and June 30th.)
- > They reported purchasing at least one ENERGY STAR-qualified CFL.

It is important to note that 2008, 2009 and 2010 data are based on one program period, while in 2011, there were two program periods. Based on the telephone screening of the random digit dial (RDD) sample of Nova Scotia residents, it was determined that the incidence of program participants was 37 percent, statistically similar to 2010 at 31 percent, and higher than 2008 and 2009 (11% and 17%, respectively).

Both surveys were conducted by Econoler's subcontractor, Corporate Research Associates Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in December utilizing computer-assisted telephone interviewing (CATI). The average length of the participant survey was 11.5 minutes whereas the average length of the non-participant survey was 8 minutes.

Both the participant and non-participant surveys were used to understand the following:

- > awareness of ENERGY STAR symbol and CFLs;
- > CFL purchases;
- > in-store promotion;
- > awareness of the discount;

- > participant motivations and barriers;
- > satisfaction with CFLs; and
- > CFL purchase intentions.

The participant survey also covered these two research themes:

- > free-ridership level for CFLs; and
- > CFL in-service rate and replacement ratio.

The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2011 participant and non-participant telephone surveys.

Throughout the report, survey results are provided for participants and non-participants. Combined results are also featured, weighted by the actual incidence of participants in the population (37% in 2011). The demographic profile of respondents is shown in Appendix II.

**Table 5: Sample Size and Sampling Error**

| Survey                            | Population     | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-----------------------------------|----------------|-----------------|-------------------------------------------|
| Participant Survey                | 116,822        | 71              | $\pm 9.8\%$                               |
| Non-Participant Survey            | 260,023        | 70              | $\pm 9.8\%$                               |
| <b>Overall Residential Survey</b> | <b>376,845</b> | <b>141</b>      | <b><math>\pm 6.9\%</math></b>             |

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation for the RMP focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

The process evaluation relied on in-depth interviews conducted with the PM and with the program partners, as well as on a telephone survey of program participants and in-store visits at participating retailers.

#### 3.2 PROGRAM MANUAL CONTENT

The RMP features a manual that contains a series of components for internal use by program staff. The program manual is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some elements of information are usually included in program manuals intended for internal use. The table below presents such information as well as what was found in the RMP manual.

**Table 6: Program Manual Content**

| Program Manual Content                                                                                       | RMP Program Manual |
|--------------------------------------------------------------------------------------------------------------|--------------------|
| Document revisions                                                                                           | ✓                  |
| Program description (including nature or type of program)                                                    | ✓                  |
| Program justification                                                                                        | ⚠                  |
| Program objectives                                                                                           | ✓                  |
| Incentives                                                                                                   | ✓                  |
| Eligibility criteria                                                                                         | Not Applicable     |
| Program partners and their roles                                                                             | ✓                  |
| Program barriers                                                                                             | ✓                  |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                  |
| Details about the savings calculations and type of products                                                  | ✓                  |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                        | RMP Program Manual |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Budget per year                                                                                                                                                                                                                                                                                                                                                               | ✓                  |
| Cost-effectiveness test results                                                                                                                                                                                                                                                                                                                                               | ✓                  |
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                                 | ✓                  |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                                | ⊘                  |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                               | ⊘                  |
| Program theory                                                                                                                                                                                                                                                                                                                                                                | ✓                  |
| Logic model                                                                                                                                                                                                                                                                                                                                                                   | ✓                  |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                    | ⊘                  |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                     | ✓                  |
| Program forms                                                                                                                                                                                                                                                                                                                                                                 | ⊘                  |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                    |

Econoler has analyzed the RMP manual. It contains relevant information that is useful for both the PM and the Evaluator. However, Econoler proposes the following recommendations to improve the tool:

- > **Document the major characteristics of the program:** The justification for deciding to have a two-month event twice a year as well as for selecting the 10 products promoted by the program is not available in the program documents. These are major characteristics of the program and should be documented in the program manual.
- > **Provide a “base case”:** The program manual does not provide what we call a “base case” that provides information on how the assumed gross savings were established. Usually, they are calculated with an algorithm using a series of variables. The identification and value of each of these variables should be available and documented for validation and updating purposes.
- > **Provide the parameters used to estimate the program objectives:** After having estimated the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual

should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. Moreover, the parameters should be continually adjusted based on the most recent evaluation results.

- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes. Additionally, our recommendation is to consider the product specifications in the development of the marketing strategy, which include relative advantage, compatibility, complexity, trialability and observability. These five characteristics are what consumers usually relate to when purchasing any goods. Focusing the marketing messages on these characteristics could be a strong argument to convince consumers to acquire them.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of the tracking sheet for the RMP. In general, the tracking sheet is consistent but contains minimal information for program administration and evaluation purposes.

The tracking sheet is filled in with data provided by the retailers during each markdown campaign. It contains relevant information that allows the PM and the Evaluator to monitor the quantity of products sold through the RMP by each retailer. It also keeps track of the return of products, which are identified with negative values. For products sold in packages, such as CFLs and programmable thermostats, the value entered in the tracking sheet corresponds to the quantity of units. This information is usually provided by the retailer. When it is not provided, ENSC researches the information itself.

The number of packages and the number of products per package are not available in the tracking sheet. This and other technical information on products, like the wattage, is provided by the retailers in a separate database. It is possible to get this information by using the stock-keeping unit (SKU) number associated with the products entered in the tracking sheet. However, some SKU numbers are missing in the retailer database. ENSC is planning to address this issue in 2012 by requiring that DAs upload the information into the ENSC management data system. Econoler strongly supports this initiative.

The tracking sheet also provides information on the retail pricing and the promotional pricing with the discount offered. However, the total discount amount given by ENSC to retailers is not defined in the tracking sheet. This information is important in order to validate whether or not the number of units is in line with the discount given.

To estimate the gross energy savings generated by the program, ENSC uses a different unitary savings value for each type of product. Nonetheless, the tracking sheet does not monitor the program gross savings; it only keeps track of the quantity of each unit sold.

Econoler also requested the PM to evaluate the program tracking sheet. The PM considers the tracking sheet relatively easy to use and is, in general, somewhat satisfied with its content. However, the PM recognizes that some enhancements could be made to improve its consistency.

Following this declaration and the observations made in this tracking sheet review, Econoler has considered some improvements that could be made to make the tool a better asset for program administration and evaluation purposes. In particular, Econoler recommends that ENSC:

- > **Monitor the energy savings in the tracking sheet:** The estimated gross savings should be computed in the tracking sheet. To do so, ENSC should add a table with the unitary savings values for each product and calculate the savings in the tracking sheet with a formula referring to the values in the unitary savings table.
- > **Keep track of the manipulation made for calculating the number of units:** For products sold in packages, the tracking sheet only contains the information on the quantity of units. It would be preferable to keep track of all the information used to convert the number of packages into a number of units. Furthermore, as the discounts are provided by package and not by unit, it would make the tracking of the discounts offered through the program easier. There is no field directly providing the total discount amount offered by ENSC and it is not possible to reconstitute this information because the number of packages is not available in the tracking sheet.
- > **Include technical information in the tracking sheet:** For evaluation purposes, technical information on products could be useful to estimate the unitary savings of products. For that reason, Econoler suggests including all the technical information provided by the retailers, such as lamp wattage and product descriptions, in the tracking sheet.
- > **Use relevant titles:** Finally, it is recommended that ENSC always use titles that reveal the content of the field. For example, the field called “CFL Type” should be changed to “Product Category” as it does not contain information on CFLs only.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, the Evaluator concludes that the markdown approach is adequate for promoting the purchase of energy-efficient products and assesses a market transformation objective. ENSC was able to convince several important retailers to participate in the program. In 2011, the program reintroduced in-store events and focused on specialty CFLs. Moreover, the Evaluator noticed that the criteria to determine which products are eligible under the program are revised regularly. This year, the criteria for refrigerators and washers were raised to CEE Tier 3. The product offer is also adequate. Multipacks of CFLs are offered, implying that the program targets households where the residual potential is high. The offer of LED lamps also constitutes the right approach as they represent a good alternative to CFLs for customers who are looking to replace their halogen lamps with lights that dissipate less heat and offer decorative advantages such as a large variety of colors. However, Econoler has identified potential means of improving program design and implementation. The following are comments and recommendations that would have an impact on the design and delivery of the program:

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Standardize the program name across all channels:** To avoid confusion, and to ensure adequate evaluation and tracking, the program name should always be the same whether it is for administrative reasons for ENSC (currently designated as the Retail Markdown Program) or for marketing purposes (it runs under the name “Plug Into Savings” in the program literature and in the market). In the past, the program was marketed under the name “Power Down.” Econoler understands that ENSC is a new organization and therefore wants to develop its presence in the market, but changing names should be kept to a minimum. The program name should reflect as much as possible the nature of the program.
- > **Analyze the market offer in order to adjust the discounted products:** Gradually, the in-store offers for the products supported by this program will increase and the unit price will decrease along with the discounts until the market reaches a level of penetration where there is no need for discounts. For this kind of program, the Evaluator recommends observing the evolution of the in-store offer. This will provide key information to the PM to adjust the discounts downward as each category of product increases its penetration.



- > **Consider conducting exit surveys:** The challenge of the Evaluator for such a program lies in the fact that participants are unknown and it is necessary to survey a large number of consumers to find an adequate sample of participants. Even then, a portion of these participants may be unaware or have forgotten that there was a discount in their purchase, making the mass survey an imprecise tool for monitoring the market. An exit survey, which usually consists of in-store intercept interviews with people who have just completed their purchases, could solve part of this problem. The exit survey would allow pinpointing the buyers of all eligible products during the promotional periods and collecting feedback on program influence.
- > **Continue to upgrade eligible discounted appliances:** In order to reduce free-ridership rates, the program should continue to upgrade the admissible tiers of the discounted appliances set by the Consortium for Energy Efficiency (CEE). However, gross savings will be lower since a dynamic baseline is used (the baseline will be higher).

## **3.5 OUTREACH AND MARKETING**

### **3.5.1 ENSC Website**

Customers can consult the ENSC website to find a large amount of information regarding the RMP (products promoted, participating retailers, etc.). The information pertaining to the RMP was available on the website only for the period of the markdown, which is a good practice to avoid confusion.

### **3.5.2 On-Site Visits**

In October and November 2011, a total of 10 visits were conducted in various stores in order to provide the qualitative information required to depict the in-store experience of clients. Nine major chain retailers and one independent retailer were visited.

These mystery visits allowed assessing the following elements:

- > efficiency of the instant discounts awarded at the counter;
- > product promotional displays;
- > knowledge of products and the program by the employees.

## **Efficiency of the Instant Discounts Awarded at the Counter**

During the visits, the mystery shoppers had to assess whether the discounts offered under the RMP were easily identifiable (on a scale from 1 to 5, where 1 meant that the discount was hard to identify and 5 that it was easy to identify). An average rating of 2.7 out of 5 was awarded. Overall, the mystery shoppers noted that the discounts were not always clearly visible and that this created confusion when it came to identifying products eligible for the program.

Most retailers rang up the discount to customers automatically at the cash register when a qualifying product was purchased. On the other hand, in the case of a few of these retailers, it was not always obvious to determine whether a discount was applied as the price of the product on the shelf and on the invoice already included the markdown discount. Furthermore, in the case of a specific retailer, several products had to be scanned in order to determine whether the discount applied since in-store staff did not know which product was eligible for the discount.

It is to be noted that one retailer failed to grant the discount provided for under the program as it was stated by the retailer that no coupon had been sent to the store for that year. Consequently, although the promotional material was visible at this retailer, no discount was offered.

## **Product Promotional Displays**

Among the 10 stores visited, six had participated in the “Plug Into Savings Special Events.” Overall, the in-store events were successful, which increased the exposure of the products offered through the program. Indeed, most representatives were in a position to inform clients adequately about available products and applicable discounts. However, for some retailers, the mystery shopper noted that a number of representatives were not very helpful and did not know about the discounts.

Furthermore, the mystery shoppers received one free CFL in four stores out of six. This was explained by the fact that one store was out of stock and the other did not give CFLs away on the day the visit was conducted.

Most of the promotional tools proposed were used in the stores visited. Among the tools found in participating retailer stores were stickers, apron cards and vertical signs. It is to be noted that no store used shelf talkers.

During the visits, the mystery shoppers were required to give a rating on a scale from 1 to 5 in order to determine whether the in-store promotional displays were optimal. The promotional displays were awarded an average rating of 3 out of 5.

The mystery shoppers noticed that overall the promotional material was neither displayed uniformly across the various sections of a given store (lighting, appliances, controls). It was noticed that the promotional display was sometimes disheveled. A lack of organization was also felt by the mystery shoppers in some of the stores. Consequently, the clients who did not know about the program had

difficulty identifying discounted products. On the other hand, in-store weekend events that took place in various stores throughout the fall greatly contributed to providing exposure to the program and delivering information to clients.

Moreover, highly deficient promotional displays were found in a couple of stores, including one independent retailer. This issue was brought up by one of the retailers contacted during the in-depth interviews. They mentioned that it was very difficult for smaller or independent stores to coordinate the efforts necessary to their participation in the program since they had not gotten any help from the head office. This goes to show that the smaller regional or independent stores may need the support of the DA to participate in the RMP.

### **Knowledge of Products and the Program by the Employees**

Overall, the salespeople were aware of the RMP and of the fact that the discounts applied to various products offered. However, they did not know the discount amount. It is understandable that many products are carried by the store and that salespeople are not expected to know all rebates offered at the store. However, it becomes more of an issue when the salespeople are unable to identify the discount amount even when referring to the prices listed on the shelves or the products. As mentioned above, the discounts were not always clearly identified. This type of situation occurred during the on-site visits and emphasizes the importance of improving the visibility of the discount amount signage.

## **3.6 RELATIONSHIP WITH PARTNERS**

### **3.6.1 Interview with Delivery Agent**

The program's delivery agent was interviewed under the process evaluation of the RMP. The DA expressed a high level of satisfaction in regard to the overall program and with respect to their relationship with participant retailers and ENSC's team. Nevertheless, the DA's main concern seems to be with the marketing strategy.

According to the DA, the main barrier to the implementation of the RMP is optimizing marketing material and tactics in preparation for in-market periods. Indeed, the DA relates retailers' concern with changing product categories or discounts a few weeks before in-market periods and their negative feedback on some specific marketing materials.

The above-mentioned challenges are partly related to the fact that the program was only active for a two-month period, twice a year. The preparation for in-market periods requires significant coordination efforts on the part of all partners involved in the program, and improvements can be made in this direction. However, periodic discounts, rather than year-round discounts, are still favoured by the DA and retailers in order to create a buzz and maintain customer interest. It is to be noted that ENSC will conduct a 10-month campaign in 2012, which will include marketing pulse. This new approach, which

extends the in-market period and features varying promotional efforts throughout the year, should resolve these challenges.

### **3.6.2 Interview with Retailers**

Six retailers were interviewed under the evaluation of the RMP. The interviewees all worked at the head office of their respective retailer banner. Different products were promoted through the RMP during the two markdown periods of the year 2011 (spring and fall). Only three products were considered for the interviews with retailers: ENERGY STAR CFLs, CEE Tier 3 ENERGY STAR clothes washers and refrigerators. The retailers answered questions based on the product(s) their stores had sold through the program.

### **Satisfaction with the Program**

The interviewees were asked to rate their level of satisfaction with regard to different aspects of the program and their overall satisfaction with the program. The retailers expressed a very high level of satisfaction with the program. Most of them also mentioned being very satisfied with the preparation process for the markdown periods. However, one retailer did refer to tight timelines.

The partners were not as satisfied with program marketing and advertising. One retailer found the marketing, more specifically the posters, to be confusing because of the different discounts offered. The marketing tools were not customized to the different products promoted through the program. Another retailer pointed out that the signage was too generic and therefore not easily adaptable to each store. Finally, one retailer suggested rethinking the marketing for it to be more customer-oriented, meaning that it should be more “eye-catching,” yet still informative.

The retailers were very satisfied with program support and communication. However, in order to make it even better, one retailer suggested limiting the number of people involved in the communications and using the same channel to communicate. Moreover, they recommended informing the retailers in advance of all promotions or events to come.

Most of the retailers mentioned being satisfied with the products promoted through the program. However, some retailers recommended adding products to the list such as weather proofing products, light fixtures, power bars with auto shut-off and ENERGY STAR televisions. Another interviewee thinks that the product list should include more construction products, such as window wraps, windows, doors and pipe wraps. Overall, the retailers expressed a high level of satisfaction with regard to the amounts of the discounts offered.

The retailers interviewed are very satisfied with their interaction with the DA as well as with discount processing, tracking and reporting.

## Opinion on Program Duration, Barriers and Recommendations

All retailers interviewed prefer a two-month offer to a year-round offer. However, some retailers do believe that the markdown periods should still be shortened in order to drive traffic and create a real urgency to buy among the customers. In that line of thought, the concept of weekend events was mentioned as being very positive.

Overall, the retailers are very satisfied with the program and wish for it to continue. They all received good comments about the program from their staff members. They strongly believe it increases awareness for energy-efficient products. They also recognize the importance of the presence of ENSC's in-store representatives and its positive impact on sales. However, in order to make the program even more effective, the retailers had other suggestions besides the recommendations already mentioned above. One retailer wishes to see more training offered to the salespeople. According to them, ENSC's sales representatives could visit the stores before the markdown periods to inform the staff of the products promoted through the program, their advantages and main characteristics. The sales representatives could use that opportunity to make sure that all marketing tools are well installed. Furthermore, another retailer thinks that more awareness and education need to be made with respect to CEE Tier 3 products.

## 3.7 CUSTOMER PERSPECTIVES

### 3.7.1 Awareness of ENERGY STAR

Participants are highly familiar with the ENERGY STAR label or symbol, with eight in 10 (80%) saying they were somewhat or very familiar with it. The level of familiarity among non-participants is significantly lower, with 61 percent saying they were somewhat or very familiar with the ENERGY STAR label or symbol.

**Table 7: Level of Familiarity with ENERGY STAR 2010 and 2011**

|                     | 2010         |                  |                               | 2011         |                  |                  |
|---------------------|--------------|------------------|-------------------------------|--------------|------------------|------------------|
|                     | Participants | Non-Participants | Total (Weighted) <sup>2</sup> | Participants | Non-Participants | Total (Weighted) |
| <i>Sample Size</i>  | 70           | 70               | 140                           | 71           | 70               | 141              |
| Very Familiar       | 36%          | 20%              | 25%                           | 35%          | 21%              | 27%              |
| Somewhat Familiar   | 43           | 44               | 44                            | 45           | 40               | 42               |
| Slightly Familiar   | 6            | 7                | 7                             | 13           | 13               | 13               |
| Not at all Familiar | 16           | 27               | 24                            | 7            | 24               | 18               |
| Don't Know          | --           | 1                | 1                             | --           | 1                | 1                |

<sup>2</sup> Throughout this report, the participant and non-participant survey results have been combined based on the actual incidence of participants 2008 (11%), 2009 (17%), 2010 (31%) and 2011 (37%).

### 3.7.2 Awareness of CFLs

Similar to 2010 results, the majority of participants reported being very familiar with CFLs after being read a description (68% in 2011, compared to 63% in 2010). Fewer non-participants were very familiar with CFLs (57%); however, this number has increased compared to 2010 findings (39%).

**Table 8: Level of Familiarity with CFLs (2011)**

|                                        | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> |
|----------------------------------------|---------------------|-------------------------|-------------------------|
| <i>Sample Size</i>                     | 71                  | 70                      | 141                     |
| Very Familiar                          | 68%                 | 57%                     | 61%                     |
| Somewhat Familiar                      | 20                  | 26                      | 23                      |
| Slightly Familiar                      | 13                  | 9                       | 10                      |
| Not at all Familiar Before Description | --                  | 6                       | 4                       |
| Don't Know                             | --                  | 3                       | 2                       |

**Table 9: Level of Familiarity with CFLs (2008 to 2010)**

|                                        | <b>2008</b>         |                         |                         | <b>2009</b>         |                         |                         | <b>2010</b>         |                         |                         |
|----------------------------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|
|                                        | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> |
| <i>Sample Size</i>                     | 60                  | 70                      | 130                     | 70                  | 71                      | 141                     | 70                  | 70                      | 140                     |
| Very Familiar                          | 68%                 | 59%                     | 59%                     | 63%                 | 62%                     | 62%                     | 63%                 | 39%                     | 46%                     |
| Somewhat Familiar                      | 30                  | 24                      | 25                      | 26                  | 28                      | 25                      | 27                  | 40                      | 36                      |
| Slightly Familiar                      | 2                   | 13                      | 11                      | 10                  | 3                       | 4                       | 9                   | 10                      | 10                      |
| Not at all Familiar Before Description | --                  | 4                       | 4                       | 1                   | 7                       | 8                       | 1                   | 9                       | 7                       |
| Don't Know                             | --                  | --                      | --                      | --                  | 1                       | 1                       | --                  | 3                       | 2                       |

In 2011, participants were asked about their familiarity with different types of CFLs. Nearly all participants (96%) and non-participants (90%) were aware of CFLs that are glass tubes bent into a spiral. Participants were generally aware of CFLs that are glass tubes bent into a U-shape or rectangle (65%), while non-participants were less familiar with this shape of CFL (34%). Meanwhile, just over one-half of participants (56%) were aware of CFLs that look like regular light bulbs but have a heavier base. Just over four in 10 non-participants (44%) were aware of this type of CFL. Thus, the familiarity with some types of specialty CFLs is rather low among the population.

**Table 10: Knowledge of CFLs (2011)**

| To the best of your knowledge, do some CFL bulbs...       | 2011         |                  |                  |
|-----------------------------------------------------------|--------------|------------------|------------------|
|                                                           | Participants | Non-Participants | Total (weighted) |
| <i>Sample Size</i>                                        | 71           | 70               | 141              |
| Have glass tubes bent into a spiral                       | 96%          | 90%              | 92%              |
| Have glass tubes bent into a U-shape or rectangular shape | 65           | 34               | 46               |
| Look like regular light bulbs, but have a heavier base    | 56           | 44               | 49               |
| (% saying yes)                                            |              |                  |                  |

### 3.7.3 Program Awareness

Three in 10 participants (30%) recalled seeing in-store promotions from ENSC regarding the purchase and use of CFLs during the markdown periods, while fewer than two in 10 participants (17%) were aware that ENSC was offering a discount for the purchase of specific CFL packages before paying at the register.

With respect to non-participants, 46 percent recalled seeing a promotion from ENSC regarding the purchase and use of CFLs in retail stores in the province, while 36 percent of non-participants were aware that ENSC was offering a discount for the purchase of specific CFL packages.

Results show a higher level of program awareness among non-participants, which is rather surprising. This can be partly explained by the fact that 2011 participants were asked specifically about program awareness during the markdown periods while non-participants were asked about program awareness during the entire year.

Despite this discrepancy between participants and non-participants, which can be due to the methodological change in the 2011 survey, it is interesting to compare 2011 non-participant results with 2010 non-participant results where no methodological change occurred. Thus, program awareness among non-participants has significantly decreased in 2011 compared to 2010 results. The drop was observed either for in-store promotions and for awareness of the discount. While the

previous Evaluator noticed that the 2010 marketing and outreach activities had resulted in extremely high awareness and recall among the population, the picture differs for 2011. Indeed, during the in-store visits conducted by Econoler, it was noticed that the promotional display was sometimes disheveled. A lack of organization was also felt by the mystery shoppers in some of the stores. Consequently, the clients had difficulty identifying discounted products.

**Table 11: Program Awareness (2011)**

|                         | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> |
|-------------------------|---------------------|-------------------------|-------------------------|
| <i>Sample Size</i>      | 71                  | 70                      | 141                     |
| Recall Seeing Promotion | 30%                 | 46%                     | 40%                     |
| Aware of Promotion      | 17                  | 36                      | 29                      |

**Table 12: Program Awareness (2008 to 2010)**

|                         | <b>2008</b>         |                         |                         | <b>2009</b>         |                         |                         | <b>2010</b>         |                         |                         |
|-------------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|
|                         | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> | <b>Participants</b> | <b>Non-Participants</b> | <b>Total (weighted)</b> |
| <i>Sample Size</i>      | 60                  | 68                      | 128                     | 70                  | 64                      | 134                     | 70                  | 70                      | 140                     |
| Recall Seeing Promotion | 25%                 | 31%                     | 29%                     | 33%                 | 31%                     | 28%                     | 76%                 | 69%                     | 71%                     |
| Aware of Promotion      | 10                  | 9                       | 9                       | 16                  | 14                      | 15                      | 81                  | 86                      | 84                      |



### 3.7.4 CFL Purchase Motivations and Barriers

Participants offered a number of reasons for purchasing CFLs during the markdown period, including to save on energy or electricity (48%), because they were replacing burned out bulbs (31%), to save on electric bills (10%) or because they wanted long-life bulbs (7%).

**Table 13: Customers' Reasons for Purchasing CFLs (2011)**

|                                      | Participants |
|--------------------------------------|--------------|
| <i>Sample Size</i>                   | 71           |
| To save energy/electricity           | 48%          |
| To replace bulbs                     | 31           |
| To save money on bills               | 10           |
| Wanted long-life bulbs               | 7            |
| Low price                            | 6            |
| Good for environment                 | 6            |
| Wanted brighter light                | 6            |
| Wanted to try                        | 4            |
| Because of an ad/marketing material  | 3            |
| Utility recommended/ENSC recommended | 1            |
| Other                                | 15           |
| Multiple responses                   |              |

**Table 14: Customers' Reasons for Purchasing CFLs (2008 to 2010)**

|                             | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|-----------------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                             | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) |
| <i>Sample Size</i>          | 60           | 64               | 124              | 70           | 58               | 128              | 70           | 61               | 131              |
| To save energy/electricity  | 82%          | 63%              | 65%              | 73%          | 71%              | 69%              | 63%          | 74%              | 70%              |
| To replace bulbs            | 3            | --               | 1                | 1            | --               | <1               | 17           | 5                | 9                |
| Wanted long-life bulbs      | 23           | 14               | 15               | 21           | 14               | 17               | 9            | 10               | 10               |
| To save money on bills      | 27           | 25               | 25               | 40           | 19               | 23               | 4            | 13               | 10               |
| Wanted to try               | 7            | 9                | 9                | 19           | 10               | 14               | 4            | 10               | 8                |
| Change in behavior          | --           | --               | --               | --           | --               | --               | 3            | 3                | 3                |
| Low price                   | 7            | 3                | 4                | 7            | 5                | 5                | 4            | 3                | 3                |
| Wanted/needed – unspecified | --           | 3                | 3                | --           | --               | --               | 6            | 3                | 4                |
| Good for environment        | 17           | 5                | 7                | 13           | 9                | 7                | 1            | 5                | 4                |
| Liked light they produce    | 3            | 2                | 2                | 4            | 2                | 2                | --           | --               | --               |
| Utility recommended         | 2            | 2                | 2                | 3            | --               | <1               | --           | --               | --               |
| Needed specialty bulbs      | 2            | --               | --               | --           | --               | --               | --           | --               | --               |
| Heard they were safer       | --           | 2                | 2                | --           | --               | --               | --           | --               | --               |
| Because of an ad            | --           | 3                | 3                | --           | --               | --               | --           | --               | --               |
| Recommended                 | --           | --               | --               | 3            | --               | 1                | --           | --               | --               |
| Fit better in fixtures      | --           | --               | --               | 1            | --               | <1               | --           | --               | --               |
| Don't know                  | --           | 3                | 3                | --           | 3                | 2                | --           | --               | --               |

Non-participants were asked the reason for which they had not purchased any CFLs during the markdown periods. The top response was because non-participants did not feel they needed them (58%) while two in 10 indicated they were waiting for the bulbs to burn out (21%).

**Table 15: Non-Participant Barriers to Purchasing CFLs (2008 to 2011)**

|                                          | 2008 | 2009 | 2010 | 2011 |
|------------------------------------------|------|------|------|------|
| <i>Sample Size</i>                       | 64   | 51   | 60   | 48   |
| Don't need them                          | 34%  | 53%  | 73%  | 58%  |
| Waiting for bulbs to burn out            | 23   | 16   | 7    | 21   |
| Too expensive                            | 6    | 8    | 5    | 8    |
| Not bright enough                        | 6    | --   | 2    | 2    |
| Don't like the color                     | --   | 2    | --   | 2    |
| Bulb contains mercury                    | --   | 2    | --   | 2    |
| Others in household purchase them        | 6    | 6    | 3    | --   |
| They don't last long/break               | --   | 4    | 2    | --   |
| Bulbs give me headaches                  | --   | 2    | 2    | --   |
| Does not fit properly                    | 6    | 2    | --   | --   |
| Not available in area/store              | 3    | --   | --   | --   |
| Interference                             | 3    | --   | --   | --   |
| Paperwork is inconvenient                | 3    | --   | --   | --   |
| Unaware of multipacks                    | 3    | --   | --   | --   |
| I'm just not that energy efficient       | 3    | --   | --   | --   |
| Renting                                  | --   | 2    | --   | --   |
| Blind                                    | --   | 2    | --   | --   |
| Don't know what they are                 | --   | 2    | --   | --   |
| I'm old, stick with what I have          | --   | 2    | --   | --   |
| Paperwork is inconvenient                | --   | 2    | --   | --   |
| Unaware of multipacks                    | --   | 2    | --   | --   |
| Not that interested in energy efficiency | --   | 2    | --   | --   |
| Other                                    | --   | --   | 7    | 15   |
| Don't know                               | 9    | 2    | 3    | 2    |
| Multiple responses                       |      |      |      |      |

Under nine in 10 non-participants (86%) currently use CFLs in their home and the average number of installed CFLs is 13.9, consistent with 2010 findings.

Combined with the reasons mentioned by non-participants for not having purchased CFLs, these findings reinforce the likelihood that non-participants did not participate in the program because they did not need to purchase CFLs during the program periods as opposed to resistance to the product.

In spite of the relatively high number of CFLs installed by non-participants, it should be noted that the residual potential still remains high. Indeed, a socket study conducted in 2011 by ENSC indicated that households in Nova Scotia have an average of 36 sockets.

**Table 16: Non-Participant CFL Use and Installations**

|                                                 | 2008 | 2009 | 2010 | 2011 |
|-------------------------------------------------|------|------|------|------|
| <i>Sample Size</i>                              | 68   | 68   | 65   | 69   |
| Currently Use CFLs                              | 85%  | 82%  | 80%  | 86%  |
| <i>Sample Size</i>                              | 57   | 55   | 65   | 57   |
| Average # of CFLs Installed                     | 11.1 | 13.3 | 13.9 | 13.9 |
| Don't know/refused responses removed from table |      |      |      |      |

### 3.7.5 CFL Purchases

Table 17 shows the estimated number of CFLs purchased by participants and non-participants during (i) past years; (ii) the program periods; and (iii) the period outside the program.

Results indicate that throughout 2011, participants purchased twice as many CFLs as did non-participants, with an average number per participant of 13.5, compared to a mere 6.5 for non-participants. During the program periods, participants also bought significantly more CFLs than did non-participants (average of 8.0 and 1.5, respectively). Outside the program period, participant purchases (5.4 CFLs) were almost the same as non-participants (4.9 CFLs). As stated in the past, the difference in purchase habits between participants and non-participants suggests that the program increased customer CFL purchases.

Furthermore, when analyzing the number of CFLs purchased during the whole year by surveyed participants and non-participants, Econoler found that an average of 9.2 CFLs per household had been bought in 2011, which is similar with what was found in previous years. This result indicates that Nova Scotia households keep buying a relatively high number of CFLs and there remains a residual potential to be bridged for CFLs, which has been confirmed by a socket study conducted in 2011 by ENSC.

When analyzing survey results related to CFL purchases, it should be kept in mind that several studies<sup>3</sup> on CFLs have shown that telephone survey respondents tended to overstate by 10 to 30 percent their responses with respect to certain aspects, such as the number of CFLs installed in their homes and their annual purchases.

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<sup>3</sup> Northwest Energy Efficiency Alliance. ENERGY STAR Consumer Products, Market Progress Report, Developed by KEMA, November 2005, pages 4-6 and 4-7. Original Source: KEMA. Phase 4 California Residential Lighting and Appliance Program Market Effects Study, 2002.

**Table 17: CFL Purchases (2008 to 2011)**

|                                                   | 2008              |                      |                     | 2009              |                      |                     | 2010              |                      |                     | 2011              |                      |                     |
|---------------------------------------------------|-------------------|----------------------|---------------------|-------------------|----------------------|---------------------|-------------------|----------------------|---------------------|-------------------|----------------------|---------------------|
|                                                   | Partici-<br>pants | Non-<br>Participants | Total<br>(weighted) | Partici-<br>pants | Non-<br>Participants | Total<br>(weighted) | Partici-<br>pants | Non-<br>Participants | Total<br>(weighted) | Partici-<br>pants | Non-<br>Participants | Total<br>(weighted) |
| <b>CFL Purchases – Past Year</b>                  |                   |                      |                     |                   |                      |                     |                   |                      |                     |                   |                      |                     |
| <i>Sample Size</i>                                | 59                | 70                   | 129                 | 67                | 58                   | 125                 | 62                | 60                   | 123                 | 71                | 68                   | 139                 |
| <b>Average</b>                                    | <b>17.3</b>       | <b>8.9</b>           | <b>9.9</b>          | <b>18.1</b>       | <b>8.7</b>           | <b>10.1</b>         | <b>12.6</b>       | <b>7.0</b>           | <b>8.8</b>          | <b>13.5</b>       | <b>6.5</b>           | <b>9.2</b>          |
| <b>Total</b>                                      | <b>1,019</b>      | <b>624</b>           | <b>1,259</b>        | <b>1,212</b>      | <b>504</b>           | <b>1,263</b>        | <b>779</b>        | <b>420</b>           | <b>1,082</b>        | <b>957</b>        | <b>442</b>           | <b>1,269</b>        |
| No Purchase                                       | 0%                | 20%                  | 18%                 | 0%                | 29%                  | 23%                 | 0%                | 25%                  | 17%                 | 0%                | 35%                  | 22%                 |
| 1 to 5                                            | 5                 | 29                   | 26                  | 9                 | 17                   | 13                  | 13                | 17                   | 16                  | 20                | 25                   | 23                  |
| 6 to 10                                           | 22                | 24                   | 24                  | 24                | 22                   | 28                  | 42                | 32                   | 35                  | 27                | 16                   | 20                  |
| 11 to 15                                          | 30                | 10                   | 12                  | 30                | 12                   | 17                  | 24                | 17                   | 19                  | 31                | 10 <sup>Q</sup>      | 18                  |
| 16 or more                                        | 43                | 17                   | 20                  | 37                | 19                   | 20                  | 21                | 10                   | 13                  | 23                | 13                   | 17                  |
| <b>CFL Purchases – Program Period</b>             |                   |                      |                     |                   |                      |                     |                   |                      |                     |                   |                      |                     |
| <i>Sample Size</i>                                | 57                | 70                   | 127                 | 70                | 71                   | 141                 | 70                | 58                   | 128                 | 70                | 65                   | 135                 |
| <b>Average</b>                                    | <b>13.2</b>       | <b>3.3</b>           | <b>4.4</b>          | <b>10.4</b>       | <b>2.4</b>           | <b>3.8</b>          | <b>6.9</b>        | <b>0.7</b>           | <b>2.9</b>          | <b>8.0</b>        | <b>1.5</b>           | <b>4.0</b>          |
| <b>Total</b>                                      | <b>751</b>        | <b>233</b>           | <b>563</b>          | <b>725</b>        | <b>168</b>           | <b>531</b>          | <b>483</b>        | <b>39</b>            | <b>371</b>          | <b>562</b>        | <b>95</b>            | <b>538</b>          |
| No Purchase                                       | 0%                | 41%                  | 36%                 | 0%                | 73%                  | 55%                 | 0%                | 90%                  | 58%                 | 0%                | 69%                  | 42%                 |
| 1 to 5                                            | 7                 | 32                   | 29                  | 27                | 14                   | 20                  | 44                | 5                    | 19                  | 44                | 22                   | 30                  |
| 6 to 10                                           | 40                | 16                   | 19                  | 46                | 6                    | 16                  | 41                | 3                    | 16                  | 29                | 6                    | 15                  |
| 11 to 15                                          | 26                | 8                    | 10                  | 9                 | 1                    | 2                   | 7                 | 2                    | 4                   | 19                | 2                    | 8                   |
| 16 or more                                        | 26                | 3                    | 6                   | 19                | 6                    | 7                   | 7                 | 0                    | 2                   | 9                 | 2                    | 4                   |
| <b>CFL Purchases – Outside the Program Period</b> |                   |                      |                     |                   |                      |                     |                   |                      |                     |                   |                      |                     |
| <i>Sample Size</i>                                | 59                | 70                   | 129                 | 70                | 71                   | 141                 | 70                | 70                   | 140                 | 70                | 65                   | 135                 |
| <b>Average</b>                                    | <b>4.1</b>        | <b>5.6</b>           | <b>5.5</b>          | <b>7.0</b>        | <b>4.7</b>           | <b>5.2</b>          | <b>4.8</b>        | <b>5.1</b>           | <b>5.0</b>          | <b>5.4</b>        | <b>4.9</b>           | <b>5.1</b>          |
| Monthly Average <sup>4</sup>                      | 0.46              | 0.62                 | .61                 | 0.82              | 0.56                 | 0.61                | 0.48              | 0.51                 | 0.50                | 0.68              | 0.61                 | 0.64                |
| <b>Total</b>                                      | <b>268</b>        | <b>391</b>           | <b>696</b>          | <b>487</b>        | <b>336</b>           | <b>732</b>          | <b>336</b>        | <b>355</b>           | <b>700</b>          | <b>379</b>        | <b>318</b>           | <b>683</b>          |
| Don't know/refused responses removed from table   |                   |                      |                     |                   |                      |                     |                   |                      |                     |                   |                      |                     |

<sup>4</sup> Monthly average is based on program period: three months in 2008 and 2009, two months in 2010 and four months in 2011.

Out of the 562 CFLs purchased by surveyed participants during the program periods, 470 (84%) were qualifying CFLs and, therefore, counted as having been purchased through the program. Over the course of the program periods, participants bought an average of 6.7 qualifying CFLs, which is generally consistent with 2010 and 2009 findings. CFLs were determined to be qualified when participants reported that they were ENERGY STAR CFLs.

**Table 18: Qualifying CFL Purchases – Program Period Participants**

|                        | 2008 | 2009 | 2010 | 2011 |
|------------------------|------|------|------|------|
| <i>Sample Size</i>     | 57   | 70   | 70   | 70   |
| Program Period Average | 10.8 | 6.5  | 4.7  | 6.7  |
| Monthly Average        | 3.6  | 2.2  | 2.4  | 1.7  |
| Total Qualifying CFLs  | 618  | 452  | 327  | 470  |

### 3.7.6 In-Service Rate

The following table summarizes participant installations of CFLs purchased during the program periods. Participants were asked how many CFLs purchased during the program periods had been installed, removed or stored. Just under six in 10 CFLs that had been purchased during the program periods were installed (57%). The CFLs that were not installed were stored (36%), removed (4%) or have not been installed yet (3%). The respondents who indicated that the CFLs had been removed stated that the lamp was not bright enough (1 respondent), that the lamp did not fit properly in the fixture (1 respondent) or that the lamp contained mercury (1 respondent).

Noteworthy is that the proportion of CFLs installed is decreasing from year to year, to the benefit of storage.

**Table 19: Installation of CFLs Purchased during the Program Period (2011)**

| Year        | Participants       | Installed | Storage | Removed | Plan to Install Soon |
|-------------|--------------------|-----------|---------|---------|----------------------|
| <b>2011</b> | <i>Sample Size</i> | 71        | 22      | 22      | 22                   |
|             | Average            | 4.4       | 2.8     | .3      | 0.2                  |
|             | % of CFLs          | 57%       | 36%     | 4%      | 3%                   |
|             | Count              | 312       | 61      | 7       | 5                    |

**Table 20: Installation of CFLs Purchased during the Program Period (2008 to 2010)**

| Year        | Participants | Installed | Storage | Removed | Plan to Install |
|-------------|--------------|-----------|---------|---------|-----------------|
| <b>2008</b> | Average      | 9.0       | 4.1     | 0.2     | 1.1             |
|             | % of CFLs    | 68%       | 31%     | 0.8%    | 9%              |
| <b>2009</b> | Average      | 8.8       | 4.3     | 0.1     | 1.6             |
|             | % of CFLs    | 81%       | 18%     | 1%      | 7%              |
| <b>2010</b> | Average      | 5.8       | 1.1     | 0.1     | 3.4             |
|             | % of CFLs    | 83%       | 17%     | 0.4%    | 9%              |

The majority of CFLs installed by participants replaced incandescent bulbs (74%), while two in 10 replaced CFLs (20%) and six percent were installed in new fixtures. These results are generally consistent with past findings.

**Table 21: Distribution of Installed CFLs – Participants**

| Bulb Type Replaced                              | 2008 | 2009 | 2010 | 2011 |
|-------------------------------------------------|------|------|------|------|
| <i>Sample Size</i>                              | 55   | 69   | 68   | 64   |
| Incandescent Bulb                               | 80%  | 85%  | 79%  | 74%  |
| CFL                                             | 9    | 6    | 15   | 20   |
| Installed in new fixture                        | 11   | 8    | 6    | 6    |
| Don't know/refused responses removed from table |      |      |      |      |



When purchasing CFLs to replace regular incandescent light bulbs, one-third of participants (33%) used the guidelines on the equivalent wattage/power that appeared on CFL packages. A small number indicates that it depended on the quantity of light needed (17%), that they use the same wattage as the bulbs to be replaced (13%) or use the number on the fixture/lamp (11%). Thus, the majority of participants (70%) chose their CFLs based on the light output equivalency.

**Table 22: Selecting Wattage for CFLs**

| Selecting Wattage                                                                                                           | 2011 Participants |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------|
| <i>Sample Size</i>                                                                                                          | 64                |
| I use the guideline about equivalent wattage/power that appears on the package                                              | 33%               |
| It depends on the quantity of light that I need - lumens                                                                    | 17                |
| I use the same wattage as with the bulbs to be replaced                                                                     | 13                |
| I use the number on the fixture/lamp                                                                                        | 11                |
| I ask a salesperson                                                                                                         | 6                 |
| I use the general 4-to-1 conversion rule where I divide the wattage of the bulb to be replaced by 4 to select the right CFL | 3                 |
| Other                                                                                                                       | 11                |
| Don't know/refused                                                                                                          | 6                 |

### 3.7.7 CFL Purchase Plans

Participants and non-participants were asked how likely they would be to purchase CFLs in the next year. Seven in 10 participants (72%) and four in 10 non-participants (40%) said they were extremely likely (a rating of '10' where '10' was extremely likely and '0' extremely unlikely) to purchase CFL bulbs in the next year. This marked an increase in likelihood for participants when compared to 2010 results. Noteworthy is that 15 percent of the population said they were extremely unlikely to purchase CFLs (rating of '1' or '0') and thus, represent laggards<sup>5</sup>.

**Table 23: Likelihood of Purchasing CFLs in the Next Year (2011)**

|                                                 | <b>Participants</b> | <b>Non-Participants</b> | <b>Total<br/>(weighted)</b> |
|-------------------------------------------------|---------------------|-------------------------|-----------------------------|
| <i>Sample Size</i>                              | 71                  | 67                      | 138                         |
| 10 'Extremely Likely'                           | 72%                 | 40%                     | 52%                         |
| 9                                               | 3                   | 4                       | 4                           |
| 8                                               | 6                   | 6                       | 6                           |
| 7                                               | 1                   | 6                       | 4                           |
| 6                                               | --                  | 4                       | 3                           |
| 5                                               | 10                  | 15                      | 13                          |
| 4                                               | --                  | 3                       | 2                           |
| 3                                               | 1                   | 1                       | 1                           |
| 2                                               | --                  | --                      | --                          |
| 1                                               | --                  | 1                       | 1                           |
| 0 'Extremely Unlikely'                          | 7                   | 18                      | 14                          |
| Don't know/refused responses removed from table |                     |                         |                             |

<sup>5</sup> According to the innovation adoption curve of Rogers, the laggards, which typically represent 16 percent of the population, are traditional people more resistant to change.

**Table 24: Likelihood of Purchasing CFLs in the Next Year (2008 to 2010)**

|                           | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|---------------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                           | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) |
| <i>Sample Size</i>        | 57           | 66               | 123              | 65           | 65               | 130              | 68           | 59               | 127              |
| 10<br>'Extremely Likely'  | 56%          | 56%              | 55%              | 55%          | 35%              | 40%              | 52%          | 54%              | 53%              |
| 9                         | 11           | 11               | 11               | 11           | 11               | 8                | 6            | 5                | 5                |
| 8                         | 7            | 15               | 14               | 12           | 11               | 20               | 25           | 7                | 13               |
| 7                         | 4            | 5                | 5                | 5            | 9                | 7                | --           | 9                | 6                |
| 6                         | 2            | 5                | 5                | --           | 3                | 2                | 4            | 10               | 8                |
| 5                         | 12           | 2                | 3                | 9            | 11               | 9                | 12           | 5                | 7                |
| 4                         | 2            | --               | --               | 2            | --               | --               | --           | --               | --               |
| 3                         | --           | --               | --               | 3            | 2                | 1                | --           | 3                | 2                |
| 2                         | 2            | --               | --               | --           | 2                | 1                | --           | --               | --               |
| 1                         | --           | --               | --               | --           | 5                | 3                | --           | --               | --               |
| 0<br>'Extremely Unlikely' | 5            | 8                | 7                | 3            | 12               | 8                | 2            | 7                | 5                |

Respondents who were unlikely to purchase CFLs in the next year (rated likelihood of less than eight) were asked what would encourage them to purchase CFLs in the next year. If current CFLs burn out or if the price is lower were top mentions for both participants and non-participants. These results are consistent with findings stating that, had the markdown periods been longer, non-participants might have been program participants.

**Table 25: Factors that Would Encourage CFL Purchases (2011)**

|                                                | <b>Participants<br/>(#)</b> | <b>Non-<br/>Participants<br/>(%)</b> | <b>Total<br/>(weighted)<br/>(%)</b> |
|------------------------------------------------|-----------------------------|--------------------------------------|-------------------------------------|
| <i>Sample Size</i>                             | 18                          | 37                                   | 55                                  |
| If current CFLs burn out                       | 7                           | 35%                                  | 36%                                 |
| Lower price                                    | 5                           | 27%                                  | 27%                                 |
| If they used less energy/were energy efficient | 2                           | 5%                                   | 7%                                  |
| If they lasted longer/didn't break             | 1                           | 3%                                   | 3%                                  |
| If they had a better colour                    | --                          | 3%                                   | 2%                                  |
| If they didn't take so long to warm up         | --                          | 3%                                   | 2%                                  |
| If they had fewer health concerns              | 1                           | --                                   | 1%                                  |
| Other                                          | 1                           | 8%                                   | 8%                                  |
| Nothing                                        | 2                           | 16%                                  | 15%                                 |
| Don't know                                     | --                          | 5%                                   | 4%                                  |

**Table 26: Factors that Would Encourage CFL Purchases (2008 to 2010)**

|                                                                                                                                                                                      | 2008 (#)     |                  |                    | 2009 (#)     |                  |                    | 2010 (#)     |                  |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|--------------------|--------------|------------------|--------------------|--------------|------------------|------------------|
|                                                                                                                                                                                      | Participants | Non-Participants | Total (unweighted) | Participants | Non-Participants | Total (unweighted) | Participants | Non-Participants | Total (weighted) |
| <i>Sample Size</i>                                                                                                                                                                   | 12           | 6                | 18                 | 12           | 22               | 34                 | 9            | 9                | 18               |
| More discounts/promotions                                                                                                                                                            | --           | --               | --                 | --           | --               | --                 | 1            | 2                | 3                |
| If current CFLs burn out                                                                                                                                                             | --           | --               | --                 | 3            | 3                | 6                  | 2            | 1                | 3                |
| If they fit in fixtures better                                                                                                                                                       | --           | --               | --                 | --           | 1                | 1                  | --           | 2                | 3                |
| Lower price                                                                                                                                                                          | 5            | 1                | 6                  | 3            | 6                | 9                  | 3            | --               | 2                |
| If they had better colour                                                                                                                                                            | --           | --               | --                 | --           | 1                | 1                  | --           | 1                | 1                |
| Make them brighter                                                                                                                                                                   | 3            | 2                | 5                  | 1            | 2                | 3                  | --           | 1                | 1                |
| Increased energy savings                                                                                                                                                             | 1            | 3                | 4                  | 1            | --               | 1                  | 1            | --               | 1                |
| If they lasted longer/didn't break                                                                                                                                                   | 3            | --               | 3                  | 1            | --               | 1                  | --           | --               | --               |
| Have plenty in storage                                                                                                                                                               | 2            | --               | 2                  | 1            | --               | 1                  | --           | --               | --               |
| If they had fewer health concerns                                                                                                                                                    | --           | --               | --                 | --           | 2                | 2                  | --           | --               | --               |
| Don't know                                                                                                                                                                           | 1            | --               | 1                  | 1            | 3                | 4                  | 3            | 2                | 5                |
| Note: In order to lighten the load of the results reported from previous years, only responses that were identified by at least two respondents have been listed in the above table. |              |                  |                    |              |                  |                    |              |                  |                  |

### 3.7.8 Satisfaction

Participants and non-participants were highly satisfied with the CFLs they installed in their home. Just two percent of participants were dissatisfied and just six percent of non-participants were dissatisfied. The one participant who was dissatisfied indicated they were dissatisfied because they were not aware that there were discounted bulbs, while the four non-participants who were dissatisfied mentioned that they did not like the light, that the light was beginning to dim or that the bulb was not bright enough.

**Table 27: Satisfaction with CFLs (2011)**

| <b>Satisfaction with CFLs</b>                                                                  | <b>Participants</b> | <b>Non-Participant<br/>s</b> | <b>Total<br/>(weighted)</b> |
|------------------------------------------------------------------------------------------------|---------------------|------------------------------|-----------------------------|
| <i>Sample Size</i>                                                                             | 62                  | 59                           | 121                         |
| Very Satisfied                                                                                 | 39%                 | 37%                          | 38%                         |
| Satisfied                                                                                      | 42                  | 42                           | 42                          |
| Neither Satisfied nor Dissatisfied                                                             | 18                  | 14                           | 15                          |
| Dissatisfied                                                                                   | --                  | 3                            | 2                           |
| Very Dissatisfied*                                                                             | 2                   | 3                            | 3                           |
| *Please note scale change: 'not at all satisfied' in 2008-2010 and 'very dissatisfied' in 2011 |                     |                              |                             |

**Table 28: Reasons for Dissatisfaction with CFLs (2011)**

| <b>Reason for Dissatisfaction with CFLs</b> | <b>2011</b>         |                         |
|---------------------------------------------|---------------------|-------------------------|
|                                             | <b>Participants</b> | <b>Non-Participants</b> |
| <i>Sample Size</i>                          | 1                   | 4                       |
| Don't like the light                        | --                  | 2                       |
| Light beginning to dim                      | --                  | 1                       |
| Bulb is not bright enough                   | --                  | 1                       |
| Was not aware there were discounted bulbs   | 1                   | --                      |
| Don't know                                  | --                  | 1                       |

**Table 29: Satisfaction with CFLs (2008 to 2010)**

|                                    | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|------------------------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                                    | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) | Participants | Non-Participants | Total (weighted) |
| <i>Sample Size</i>                 | 54           | 58               | 112              | 60           | 55               | 115              | 65           | 52               | 117              |
| Very Satisfied                     | 52%          | 66%              | 64%              | 55%          | 45%              | 49%              | 40%          | 37%              | 38%              |
| Satisfied                          | 44           | 29               | 31               | 42           | 36               | 34               | 55           | 54               | 54               |
| Neither Satisfied nor Dissatisfied | 4            | 2                | 2                | 2            | 7                | 6                | 2            | 4                | 3                |
| Dissatisfied                       | --           | 2                | 2                | 2            | 9                | 11               | 3            | 6                | 5                |
| Not at all Satisfied               | --           | 2                | 2                | --           | 2                | 1                | --           | --               | --               |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the RMP for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > unitary savings per product;
- > replacement ratio of CFLs to CFLs;
- > energy-to-demand ratio;
- > interactive effects;
- > free-ridership; and
- > spillover through market effects generated by the program.

The impact evaluation is the result of three main activities: a review of unitary savings, the CFL-buyer participant survey and retailer interviews.

The gross energy savings evaluation is based on a review of the unitary savings used in the 2010 evaluation. Two products were added to the RMP in 2011: LED lamps and motion sensors. For these products, Econoler conducted a literature review to find studies that had analyzed the savings resulting from their installation. For CFLs, the participant survey was used to establish the replacement ratio of CFL to CFL.

The participant survey as well as retailer interviews were used to estimate the free ridership ratio and evaluate if the program had generated spillover through market effects for its three most important products: CFLs, ENERGY STAR clothes washers and ENERGY STAR refrigerators.

### **4.2 GROSS SAVINGS**

For each type of product sold through the RMP, ENSC uses a unitary savings value that comes from the 2010 RMP evaluation, from the Ontario Power Authority (OPA) Prescriptive Measures and Assumptions reports<sup>6</sup> or from Navigant Consulting. Many unitary savings values are based on the OPA's 2010 Prescriptive Measures and Assumptions report, which lists a collection of electricity conservation measures and presents energy and demand savings using prescriptive input assumptions. Since the last evaluation, the 2010 report was reviewed. However, most of the energy

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<sup>6</sup> Ontario Power Authority (OPA), "2010 Prescriptive Measures and Assumptions" and "2011 Prescriptive Measures and Assumptions," <http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists>.



and demand savings remain the same. In the case where the assumptions were modified from 2010 to 2011, it is noted in the unitary savings review for the product.

#### 4.2.1 Regular and Specialty CFLs

ENSC uses the same unitary savings value of 41 kWh for all CFLs installed or sold under its residential programs. This assumption comes from an analysis conducted for the 2009 evaluation of the Low Income Homeowner program. This evaluation presented several studies indicating that 13 W CFLs have an annual savings between 29.6 kWh and 44.3 kWh and recommended that the 41 kWh savings assumption continue to be used. Considering that 13 W CFLs usually replace 60 W incandescent bulbs, the time of operation used to calculate the 41 kWh saving assumption should be equal to 2.4 h/day, which corresponds to the daily usage of interior fixtures estimated from the telephone survey conducted in 2010 for the RMP.

Econoler has revised this unitary savings value by using the retailer information on CFL wattage and data on hours of use metered for similar programs. The review includes both regular and specialty CFLs since the two products are in the same range of wattage.

##### Displaced Wattage

The average displaced wattage was calculated by comparing the average wattage of CFLs sold through the program and the average equivalent wattage of the incandescent lamps replaced, using the light output equivalency presented in the figure below.

**Figure 3: Light Output Equivalency for Incandescent Lamps to CFLs<sup>7</sup>**

| LIGHT OUTPUT EQUIVALENCY      |                                     |                                                        |
|-------------------------------|-------------------------------------|--------------------------------------------------------|
| INCANDESCENT BULBS<br>(WATTS) | MINIMUM<br>LIGHT OUTPUT<br>(LUMENS) | COMMON ENERGY STAR<br>QUALIFIED LIGHT BULBS<br>(WATTS) |
| 40                            | 450                                 | 9 TO 13                                                |
| 60                            | 800                                 | 13 TO 15                                               |
| 75                            | 1,100                               | 18 TO 25                                               |
| 100                           | 1,600                               | 23 TO 30                                               |
| 150                           | 2,600                               | 30 TO 52                                               |

<sup>7</sup> ENERGY STAR, "ENERGY STAR Qualified Light Bulbs – 2006 Partner Resource Guide."

When Econoler conducted this analysis, the fall campaign was still in operation. Therefore, the analysis was based on the wattage of CFLs sold during the spring campaign. The wattage information provided by retailers covered 99.6 percent of the CFLs sold during this period.

The analysis revealed that the average power of the CFLs is 14.4 watts and the average equivalent power of the incandescent lamps replaced is 64.9 watts. Therefore, the typical difference of wattage ( $\Delta W$ ) between the CFLs installed through the program and the old lamps replaced is equal to 50.5 watts.

$$\Delta W = 64.9 W - 14.4 W = 50.5 W$$

Moreover, the CFL-buyer participant survey showed that the majority of participants (70%) chose their CFLs based on the light output equivalency (Table 22). This result confirms the adequacy of using the light output equivalency to estimate the displaced wattage.

### Hours of Operation

Econoler also revised the daily usage of CFLs, estimated at 2.4 hours by ENSC, based on CFL metering studies highlighted in the table below.

**Table 30: Daily Usage of CFLs from Metering Studies**

| Hours of Use       |                    | Sampling    | Source                                    |
|--------------------|--------------------|-------------|-------------------------------------------|
| Indoor: 2.65 h/day | Outdoor: 3.6 h/day | 200 sites   | Econoler, Hydro-Québec, 2010 <sup>8</sup> |
| Indoor: 2.28 h/day | Outdoor: 3.1 h/day | 752 loggers | KEMA, California, 2005 <sup>9</sup>       |
| Indoor: 2.6 h/day  |                    | 97 loggers  | MA-RI-VT Study, 2005 <sup>10</sup>        |

Econoler used the daily usage times from Hydro-Québec. These values were obtained from a study conducted in the province of Quebec, with hours of illumination and household characteristics similar to those in Nova Scotia. In the Hydro-Québec study, the indoor daily usage was metered and the outdoor daily usage was based on participant declaration for each CFL installed outside the house.

<sup>8</sup> Econoler, "Evaluation Report: Programme Produits Mieux Consommer – Éclairage résidentiel, presented to Hydro-Québec, Quebec, March 30, 2011.

<sup>9</sup> KEMA, "CFL Metering Study – Final Report," Oakland, California, February 25, 2005.

<sup>10</sup> NEXUS MARKET RESEARCH & RLW ANALYTICS, "Impact Evaluation of the Massachusetts, Rhode Island and Vermont 2003 Residential Lighting Programs," Final Report, October 1, 2004.

In 2011, ENSC conducted a socket study with 1,004 respondents. This study investigated CFL installations, indicating that 94 percent of CFLs were installed inside houses while the remaining 6 percent were installed in outdoor sockets. Using this proportion of CFLs installed inside and outside houses, the daily usage of CFLs was calculated and estimated at a global value of 2.7 hours per day.

$$Global\ Daily\ Usage = \left( 94\% \times 2.65 \frac{h}{day} \right) + \left( 6\% \times 3.6 \frac{h}{day} \right) = 2.7 \frac{h}{day}$$

Econoler considers that the daily usage of 2.7 hours from Hydro-Québec's metering study<sup>11</sup> is more accurate than the value used by ENSC (2.4 h/day) which was estimated from participant declarations during a telephone survey. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behaviour factors can influence the respondents' answers.

### Unitary Savings Calculation

The following equation presents the unitary savings calculation.

$$Annual\ Unitary\ Savings = \frac{(50.5\ W) \times 2.7 \frac{h}{day} \times 365 \frac{day}{yr}}{1000 \frac{W}{kW}} = 49.8 \frac{kWh}{yr}$$

The 2011 RMP impact evaluation revised the unitary savings value of 41 kWh used for CFLs in the program tracking sheet and estimated that this value should be adjusted to an annual unitary savings value of 49.8 kWh.

### Replacement Ratio

As it has been a number of years since CFLs have been introduced in the market, it is likely that many CFLs will be replacing other CFLs. Such replacement affects a portion of the market that is already transformed and does not generate savings attributable to the program.

A replacement ratio was measured through the CFL-buyer participant survey in order to take into consideration this phenomenon and subtract from the gross savings calculations the CFLs that replaced other CFLs. The CFL-buyer participant survey revealed an incandescent replacement ratio of 80 percent, meaning that 20 percent of the CFLs purchased through the markdown campaigns replaced other CFLs. This ratio is applied to the quantity of regular CFLs registered in the tracking sheet before the gross savings calculations.

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<sup>11</sup> Econoler, "Evaluation Report: Programme Produits Mieux Consommer – Éclairage résidentiel," presented to Hydro-Québec, Quebec, March 30, 2011.

The reason why the replacement ratio is only applied to regular CFLs can be explained by the fact that specialty CFLs were introduced in the market later than were regular CFLs. It is thus less likely to see specialty CFLs replacing old specialty CFLs. Moreover, the participant survey was targeting CFL buyers in general. Since regular CFLs represent a larger proportion of CFLs sold on the market, the survey results can only be applied to regular CFLs. Specialty CFLs have particularities that prevent them from being considered as regular CFLs, such as higher prices and a lower penetration rate.

#### In-Service Rate

For various reasons, it is possible for a participant to decide to remove a CFL after its installation. The CFL-buyer participant survey was used to verify this phenomenon. The results demonstrate a low level of removal where only 4 percent of the CFLs purchased during the markdown periods were removed. Therefore, the in-service rate of regular CFLs is estimated at 96 percent.

#### Final Unitary Savings Value

The unitary savings value of 49.8 kWh, the replacement ratio of 80 percent and the in-service rate of 96 percent are used in the gross savings evaluation for all regular CFLs sold or given away through the activities conducted under the RMP. These activities include the spring and fall markdown campaigns and the Air Miles pilot project.

### **4.2.2 LED Lamps**

LED lamps are a new product in the RMP. In the tracking sheet, ENSC uses a unitary savings value of 8.75 kWh. The assumptions behind this savings value were not available when making this evaluation so the Evaluator based its review on other sources of data.

The average displaced wattage of LED lamps was calculated by comparing the average wattage of LEDs sold through the program and the average equivalent wattage of the standard lamps replaced, using the manufacturers' specifications. To do so, Econoler consulted the website of participating retailers to investigate on the replacement scenario suggested for each LED model sold through the RMP.

The analysis revealed that the average wattage of LEDs sold through the RMP was 10.1 watt and the average equivalent wattage for the standard lamps replaced is 52.4 watt, which corresponds to a displaced wattage of 42.3 watts. This assumption was validated by comparing the average number of lumens provided by 10 watt LED lamps. Based on the ENERGY STAR-qualified lamp product list<sup>12</sup>, a 10 watt LED lamp provides 507 lumens on average. According to the ENERGY STAR light output

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<sup>12</sup> ENERGY STAR-Qualified Product List, <http://www.energystar.gov>, list posted on January 17, 2012.

equivalency table, it is between an incandescent lamp of 40 and 60 watt, which confirms the displaced wattage of 42.3 watt estimated for LEDs.

Econoler estimated that the average daily usage of LED lamps was the same for CFLs; i.e., 2.7 hours per day. This value is based on a metering study conducted for Hydro-Québec's residential lighting program.

Using the displaced wattage and the hours of operation presented above, Econoler calculated a unitary savings value of 41.7 kWh per year.

$$\text{Annual Unitary Savings} = \frac{(42.3 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 41.7 \frac{\text{kWh}}{\text{yr}}$$

This adjusted value was used in this year's evaluation to estimate the savings generated by the installation of LED lamps.

### 4.2.3 Dimmer Switches

For dimmer switches, ENSC uses a unitary savings value of 23.65 kWh per year. This value comes from the 2010 RMP evaluation report and is based on the OPA report, using the parameters below.

**Table 31: Unitary Savings Calculation for Dimmer Switches**

| Parameters            | Values             |
|-----------------------|--------------------|
| Wattage               | 2 × 60 W = 120 W   |
| Dimmed Wattage        | 80% × 120 W = 96 W |
| Operating Time        | 2.7 h/day          |
| <b>Annual Savings</b> | <b>23.65 kWh</b>   |

The OPA assumes that the light output from light fixtures with dimmer switches is lowered by 25 percent, resulting in 20 percent energy savings. Econoler could not find any other jurisdictions estimating the annual savings resulting from the installation of dimmer switches. The Evaluator considers that the parameters used in the unitary savings calculation are realistic. The hours of operation are the same as those used for CFLs and the wattage seems appropriate since dimmer switches are mainly installed on incandescent lamps.

#### 4.2.4 Indoor Motion Sensors

Indoor motion sensors were added to the RMP in 2011. In the tracking sheet, ENSC uses a unitary savings value of 63.95 kWh based on the 2010 OPA report. The following table presents the different assumptions used in the 2010 report to estimate this unitary savings value.

**Table 32: Unitary Savings Calculation for Indoor Motion Sensors**

| Parameters                       | 2010 OPA Report    |
|----------------------------------|--------------------|
| Fixture Wattage                  | (2 × 60 W) = 120 W |
| Old Operating Time               | 2.7 h/day          |
| New Operating Time – with Sensor | 1.24 h/day         |
| <b>Annual Savings</b>            | <b>63.95 kWh</b>   |

An average reduction in operating time of 54 percent is used. The operating time of 2.7 h/day is consistent with the metering study conducted by Hydro-Québec for CFLs and presented in Section 4.2.1. Since the assumptions were deemed realistic, Econoler decided to continue using the unitary savings value of 63.95 kWh per year for indoor motion sensors.

#### 4.2.5 Outdoor Motion Sensors

Outdoor motion sensors were also added to the RMP in 2011. As with indoor motion sensors, ENSC uses the unitary savings estimated by the OPA for outdoor motion sensors. This value amounts to 159.38 kWh based on the assumptions below.

**Table 33: Unitary Savings Calculation for Outdoor Motion Sensors**

| Parameters                       | Values            |
|----------------------------------|-------------------|
| Average Lamp Wattage             | 242.6 W           |
| Old Operating Time               | 4.75 h/day        |
| New Operating Time – with Sensor | 2.95 h/day        |
| <b>Annual Savings</b>            | <b>159.38 kWh</b> |

The average lamp wattage is determined by the assumption that 85 percent of outdoor lighting is for security spotlights with an average power of 275.6 watts<sup>13</sup>, and that the remaining 15 percent is for porch lighting, which has an average power of 55.5 watts. For the reduction in operating time, the assumption of the OPA is conservative. It estimates that the reduction in operating time corresponds to 75 percent when the lights are on all night (11.78 h/day), resulting in a new operating time – with sensor – equalling 2.95 hours per day. However, to calculate the unitary savings, the OPA considers an operating time of 4.75 hours/day for the baseline, which corresponds to households leaving lights on during evening hours only. Since these assumptions are conservative and no other study contradicts them, Econoler recommends continuing to use the unitary savings value of 159.38 kWh per year for outdoor motion sensors.

#### 4.2.6 Power Bars with Integrated Timer

Power bars with integrated timer help reduce standby power. Various groups of electronic devices can be plugged into a power bar with integrated timer and a time frame can be set to shut them down completely when they are not used.

In the tracking sheet, an average unitary savings value of 53 kWh per year is used for this product. This value comes from the OPA report and is based on the assumptions below.

**Table 34: Unitary Savings Calculation for Power Bars with Integrated Timer**

| Parameters                      | Entertainment Center | Computer System | Lighting   | Other      |
|---------------------------------|----------------------|-----------------|------------|------------|
| Proportion                      | 40.3%                | 15.7%           | 19.4%      | 24.6%      |
| Average wattage                 | 38.1 W               | 28 W            | 60 W       | 28 W       |
| Old operating time              | 9 h/day              | 14 h/day        | 6 h/day    | 11 h/day   |
| New operating time – with timer | 5 h/day              | 8 h/day         | 3 h/day    | 4 h/day    |
| Operating season                | 12 months            | 12 months       | 8.5 months | 8.6 months |
| <b>Annual Savings</b>           | <b>53.09 kWh</b>     |                 |            |            |

Econoler considers these assumptions acceptable and will use the unitary savings value of 53 kWh per year in its evaluation for all power bars purchased through the RMP.

<sup>13</sup> Representative bulb mix:  $(85\% \times 2 \times 150 \text{ W incandescent}) + (10\% \times 2 \times 90 \text{ W halogen}) + (5\% \times 2 \times 26 \text{ W CFL}) = 275.6 \text{ W}$ .

#### 4.2.7 Heavy Duty Timers

For heavy duty timers, ENSC uses a unitary savings value of 383.65 kWh per year. It is based on the OPA report, using the parameters below.

**Table 35: Unitary Savings Calculation for Outdoor Motion Sensors**

| Parameters                       | Values                       |
|----------------------------------|------------------------------|
| Average wattage                  | 746 W (1 HP pool pump power) |
| Motor efficiency                 | 70%                          |
| Old operating time               | 10 h/day                     |
| New operating time – with sensor | 6 h/day                      |
| Annual operating time            | 90 days/year                 |
| <b>Annual Savings</b>            | <b>383.65 kWh</b>            |

The assumptions of the OPA for heavy duty timers were evaluated in the 2010 impact evaluation. The reduction in pool pump operation from ten to six hours per day was then estimated as reasonable.

Multiple sources citing six hours per day as a reasonable reduced operating time for pool pumps were found:

- > The U.S. Department of Energy:  
[http://www.energysavers.gov/your\\_home/water\\_heating/index.cfm/mytopic=13290](http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13290)
- > The White River Valley Electric Cooperative:  
[https://wrve.opower.com/ei/app/tip/tip122\\_reduce\\_pool\\_pump\\_run-time](https://wrve.opower.com/ei/app/tip/tip122_reduce_pool_pump_run-time)

As the assumptions used in the calculations performed by the OPA still appeared to be reasonable for 2011, Econoler used the same unitary savings value of 383.65 kWh per year in this evaluation.

#### 4.2.8 Programmable Thermostats

For programmable thermostats, ENSC uses a unitary savings value of 63.15 kWh per year. This value comes from the OPA report. The baseline corresponds to a standard electronic thermostat. As a result, the energy savings are calculated from the temperature set back that can be set at night with a



programmable thermostat. To do so, the OPA considered a savings value of 1 percent for every degree set back<sup>14</sup>.

For this year's evaluation, Econoler revised the unitary savings value used by ENSC. First, Econoler had some doubts about the percentage of savings per degree of setback used by the OPA. The 1 percent savings per degree of setback comes from the U.S. Department of Energy and should be applicable to Fahrenheit and not to degree Celsius as the OPA used. The percentage of savings per degree Celsius of setback should be higher than for Fahrenheit. Moreover, based on 2004 industry data, the ENERGY STAR savings calculator for programmable thermostats assumes a 3 percent savings per Fahrenheit of setback (5.4 percent per degree Celsius)<sup>15</sup>. Knowing that, Econoler suggests using another source of data for estimating the energy savings from the temperature setback on a programmable thermostat.

Second, the OPA uses a baseline corresponding to a standard electronic thermostat. However, the installers of programmable thermostats for the Multi-Unit Residential Renter (MURR) program revealed that the baseline in Nova Scotia's market should rather correspond to a bimetallic thermostat. Indeed, they explained that the programmable thermostats they install are mostly replacing bimetallic thermostats. For the few electronic thermostats already in place, the customers did not plan to replace them by programmable thermostats since, for most of the cases, they had recently been installed. This means that additional savings can be applied to the accuracy of having an electronic thermostat instead of a bimetallic thermostat that uses on/off controls.

Therefore, Econoler reviewed another study to adjust the unitary savings value used for programmable thermostats. The 2009 evaluation of Hydro-Québec's Residential Electronic Thermostats in its New Construction program<sup>16</sup> estimated the energy savings generated by the thermostat accuracy and by the temperature setback. The table below presents the results of this evaluation.

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<sup>14</sup> U.S. Department of Energy, Energy Savers – Thermostats and Control Systems, [www.energysavers.gov](http://www.energysavers.gov), last update: 2011-09-02.

<sup>15</sup> ENERGY STAR, Programmable Thermostats for Consumers, Savings Calculator (Excel File), [www.energystar.gov](http://www.energystar.gov), date of consultation: 2012-01-11.

<sup>16</sup> Econoler, "Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel," Final Report presented to Hydro-Québec, February 9, 2009.

**Table 36: Main Outputs from Hydro-Québec's Evaluation of Electronic Thermostat Savings**

| Calculation Parameters                                                               | Housing Type    |                                 |           |
|--------------------------------------------------------------------------------------|-----------------|---------------------------------|-----------|
|                                                                                      | Single-Detached | Duplex / Triplex /<br>Townhouse | Apartment |
| <b>Gross Energy Savings for Electronic Thermostat Accuracy</b>                       |                 |                                 |           |
| Percentage of savings due to the thermostat accuracy                                 | 9.0%            | 5.5%                            | 4.5%      |
| Annual consumption for electric space heating (before thermostat installation) [kWh] | 12,542          | 7,734                           | 4,782     |
| Savings per housing [kWh]                                                            | 1,129           | 425                             | 215       |
| Number of thermostats per housing                                                    | 9.36            | 4.52                            | 3.55      |
| Savings per thermostat [kWh]                                                         | 121             | 94                              | 61        |
| <b>Gross Energy Savings for Temperature Setback with Programmable Thermostats</b>    |                 |                                 |           |
| Savings per housing [kWh]                                                            | 434             | 333                             | 225       |
| Number of programmable thermostats per housing                                       | 4.33            | 1.66                            | 1.91      |
| Savings per thermostat [kWh]                                                         | 100             | 201                             | 118       |

For the calculation of savings generated by the electronic thermostat accuracy, the percentages of savings were based on research supervised by Hydro-Québec's laboratory of energy technologies (LTE)<sup>17</sup>. The research used results from tests conducted in LTE environmental chambers and in single-family homes by comparing the operation of bimetallic thermostats versus electronic thermostats and the consumption of houses with bimetallic thermostats versus electronic thermostats. The annual consumption for electric space heating was estimated through a billing analysis including 25,703 clients and 206,861 billing periods.

For the calculation of savings achieved by the temperature setback, the savings per housing resulted from a billing analysis regression which compared the consumption of houses with electronic thermostats and houses with programmable thermostats.

The unitary savings value of 63.15 kWh currently used by ENSC is a theoretical value based on an engineering calculation. Therefore, Econoler considers it more adequate to use the results from the tests conducted in environmental chambers and in single-family homes as well as from the billing analysis carried out by Hydro-Québec through its evaluation report. Moreover, it includes the savings due to the higher level of accuracy obtained from the replacement of an old bimetallic thermostat with

<sup>17</sup> Hydro-Québec – Laboratoire des technologies de l'énergie (LTE), "Sommaire exécutif de rapports publiés par Hydro-Québec concernant les économies d'énergie dues aux thermostats électroniques," October 2004.

an electronic model. Since the field data from the MURR program shows that the baseline in Nova Scotia's residential market should be established as bimetallic thermostats, Econoler considers that these savings should be added to the temperature setback savings.

To make these savings applicable to the programmable thermostats sold through the RMP, Econoler calculated an average unitary savings value based on the proportion of housing type in Nova Scotia's residential market.

**Table 37: Unitary Savings Estimation for Programmable Thermostats**

| Calculation Parameters                                                     | Housing Type    |                                 |           |
|----------------------------------------------------------------------------|-----------------|---------------------------------|-----------|
|                                                                            | Single-Detached | Duplex / Triplex /<br>Townhouse | Apartment |
| Proportion of housing type                                                 | 76%             | 11%                             | 13%       |
| Gross Energy Savings for Electronic Thermostat Accuracy                    |                 |                                 |           |
| Savings per thermostat [kWh]                                               | 121             | 94                              | 61        |
| Average savings per thermostat [kWh]                                       | 110             |                                 |           |
| Gross Energy Savings for Temperature Setback with Programmable Thermostats |                 |                                 |           |
| Savings per thermostat [kWh]                                               | 100             | 201                             | 118       |
| Average savings per thermostat [kWh]                                       | 113             |                                 |           |

Thus, the total unitary savings value associated with the installation of a programmable thermostat is equal to 223 kWh per year. This value will be used in the 2011 impact evaluation of the RMP.

#### 4.2.9 CEE Tier 3 ENERGY STAR Refrigerators

The 2010 impact evaluation estimated an annual unitary savings value of 112.8 kWh for ENERGY STAR refrigerators sold through the program. This value is based on the OPA report, using an annual energy consumption of 564.01 kWh for a standard refrigerator and 451.21 kWh for an ENERGY STAR refrigerator.

At the beginning of 2011, the target for this product was raised to CEE Tier 3 ENERGY STAR refrigerators, which are the most efficient models. Therefore, Econoler adjusted the unitary savings value to the new program target. The consumption used for a standard refrigerator remains the same.

The average consumption for CEE Tier 3 refrigerators was determined by using the model numbers of refrigerators sold during the spring campaign and the corresponding annual consumption found in the

CEE list of qualified products. Using the CEE qualifying product list<sup>18</sup>, Econoler calculated the average consumption of the top five refrigerator models sold during the spring campaign for which the SKU number was available.

**Table 38: Unitary Savings Calculation for CEE Tier 3 Refrigerators**

| Parameters                                       | Values         |
|--------------------------------------------------|----------------|
| Base Annual Consumption – Standard Refrigerator  | 564 kWh        |
| New Annual Consumption – CEE Tier 3 Refrigerator | 334 kWh        |
| <b>Unitary Savings per Refrigerator</b>          | <b>230 kWh</b> |

As a result, Econoler adjusted the unitary savings value of 112.8 kWh used in the tracking sheet to a value of 230 kWh, taking into consideration the new program target for CEE Tier 3 ENERGY STAR refrigerators. This unitary savings value is used for evaluating the savings resulting from the refrigerators sold through the spring and fall markdown campaigns as well as through the Air Miles pilot project.

#### **4.2.10 CEE Tier 3 ENERGY STAR Clothes Washers**

The 2010 impact evaluation estimated an annual unitary savings value of 242 kWh for ENERGY STAR clothes washers sold through the program. This estimate is based on the annual consumption value of 181.27 kWh from the OPA report, increased by 34 percent according to a comparison with savings estimates for ENERGY STAR clothes washers developed by the evaluation firm Cadmus Group.

In 2011, the RMP target for this product was raised to CEE Tier 3 ENERGY STAR clothes washers, which represents the most efficient models. Therefore, Econoler adjusted the unitary savings value to reflect this new target. The consumption used for a standard clothes washer is based on an average washer size of 55 litres and a usage of 7.5 cycles per week, which corresponds to the Canadian Standards Association criteria<sup>19</sup>.

The average consumption for CEE Tier 3 clothes washers was determined by using the model numbers of the clothes washers sold during the spring campaign and the corresponding annual consumption found in the CEE list of qualified products. Using the ENERGY STAR-qualified product

<sup>18</sup> Consortium for Energy Efficiency (CEE), Residential Refrigerators Qualifying Product List, <http://www.cee.1.org>, December 15, 2011.

<sup>19</sup> CSA-C360-03, Energy Performance, Water Consumption, and Capacity of Household Clothes Washers, January 2005.

list<sup>20</sup>, Econoler calculated the average consumption of the top five clothes washer models sold during the spring campaign for which the SKU number was available.

**Table 39: Unitary Savings Calculation for CEE Tier 3 Clothes Washers**

| Parameters                                         | Values         |
|----------------------------------------------------|----------------|
| Base Annual Consumption – Standard Clothes Washer  | 604 kWh        |
| New Annual Consumption – CEE Tier 3 Clothes Washer | 135 kWh        |
| <b>Annual Unitary Savings</b>                      | <b>469 kWh</b> |

As a result, Econoler adjusted the unitary savings value of 242 kWh used in the tracking sheet to a value of 469 kWh, taking into consideration the new program target for CEE Tier 3 ENERGY STAR clothes washers. This surge in the target for eligible clothes washers is responsible for this important increase in the unitary savings value. Indeed, the majority of clothes washers sold through the RMP use 94 percent less energy than the Federal standard. This unitary savings value is used for evaluating the savings resulting from the clothes washers sold through the spring and fall markdown campaigns as well as through the Air Miles pilot project.

#### 4.2.11 Energy-to-Demand Ratio

Econoler calculated the demand savings for the RMP based on an energy-to-demand ratio of 9.94 GWh/MW. This ratio was obtained from the adjusted 2011 RMP targets, by dividing the target energy savings by the target peak demand savings.

#### 4.2.12 Revised Gross Savings

The annual gross savings for each category of products promoted by the RMP are presented in Table 40. They were calculated using the revised unitary savings established in the previous section. The products included in the gross savings calculations are as follows:

- > all the products sold during the markdown periods;
- > specialty CFLs given away during the in-store weekend events; and
- > CFLs as well as CEE Tier 3 ENERGY STAR refrigerators and clothes washers sold through the Air Miles pilot project.

<sup>20</sup> ENERGY STAR, Residential Clothes Washers Qualified Product List, <http://www.energystar.gov>, list posted on January 16, 2012.

Overall, the total gross energy and demand savings amount to 17.875 GWh and 1.798 MW at the meter. The gross savings at generator level are also estimated in Table 40, using a line loss factor between the meter and the generator of 1.1050. This value was provided by ENSC and corresponds to the line loss factor for residential customers. At the generator, the gross energy and demand savings correspond to 19.752 GWh and 1.987 MW.

**Table 40: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                       | Regular CFLs   | Specialty CFLs | LED Lamps    | Dimmer Switches | Indoor Motion Sensors | Outdoor Motion Sensors | Power Bars with Timer | Heavy Duty Timers | Prog. Thermostats | Tier 3 Refrigerators | Tier 3 Clothes Washers |
|--------------------------------------------------------|----------------|----------------|--------------|-----------------|-----------------------|------------------------|-----------------------|-------------------|-------------------|----------------------|------------------------|
| <b>Energy Savings</b>                                  |                |                |              |                 |                       |                        |                       |                   |                   |                      |                        |
| Number of units – spring markdown campaign             | 76,468         | 8,761          | 1            | 3,057           | 51                    | 3                      | 58                    | 316               | 1,279             | 403                  | 1,702                  |
| Number of units – fall markdown campaign               | 114,564        | 27,586         | 1,704        | 4,679           | 156                   | 16                     | 145                   | 4,334             | 6,383             | 815                  | 2,821                  |
| Number of units – in-store weekend events              | -              | 30,000         | -            | -               | -                     | -                      | -                     | -                 | -                 | -                    | -                      |
| Number of units – Air Miles pilot project              | 28,470         | -              | -            | -               | -                     | -                      | -                     | -                 | -                 | 0                    | 2                      |
| Total number of units                                  | <b>219,502</b> | <b>66,347</b>  | <b>1,705</b> | <b>7,736</b>    | <b>207</b>            | <b>19</b>              | <b>203</b>            | <b>4,650</b>      | <b>7,662</b>      | <b>1,218</b>         | <b>4,525</b>           |
| Replacement ratio                                      | 80%            | -              | -            | -               | -                     | -                      | -                     | -                 | -                 | -                    | -                      |
| In-service rate                                        | 96%            | -              | -            | -               | -                     | -                      | -                     | -                 | -                 | -                    | -                      |
| Total number of units generating savings               | 168,578        | 66,347         | 1,705        | 7,736           | 207                   | 19                     | 203                   | 4,650             | 7,662             | 1,218                | 4,525                  |
| Unitary Savings (kWh)                                  | 49.8           | 49.8           | 41.7         | 23.65           | 63.95                 | 159.38                 | 53                    | 383.65            | 223               | 230                  | 469                    |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>8.395</b>   | <b>3.304</b>   | <b>0.071</b> | <b>0.183</b>    | <b>0.013</b>          | <b>0.003</b>           | <b>0.011</b>          | <b>1.784</b>      | <b>1.709</b>      | <b>0.280</b>         | <b>2.122</b>           |
| Line loss factor                                       | 1.1050         | 1.1050         | 1.1050       | 1.1050          | 1.1050                | 1.1050                 | 1.1050                | 1.1050            | 1.1050            | 1.1050               | 1.1050                 |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>9.277</b>   | <b>3.651</b>   | <b>0.079</b> | <b>0.202</b>    | <b>0.015</b>          | <b>0.003</b>           | <b>0.012</b>          | <b>1.971</b>      | <b>1.888</b>      | <b>0.310</b>         | <b>2.344</b>           |
| <b>Demand Savings</b>                                  |                |                |              |                 |                       |                        |                       |                   |                   |                      |                        |
| Energy-to-demand ratio                                 | 9.94           | 9.94           | 9.94         | 9.94            | 9.94                  | 9.94                   | 9.94                  | 9.94              | 9.94              | 9.94                 | 9.94                   |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.845</b>   | <b>0.332</b>   | <b>0.007</b> | <b>0.018</b>    | <b>0.001</b>          | <b>0.0003</b>          | <b>0.001</b>          | <b>0.179</b>      | <b>0.172</b>      | <b>0.028</b>         | <b>0.214</b>           |
| Line loss factor                                       | 1.1050         | 1.1050         | 1.1050       | 1.1050          | 1.1050                | 1.1050                 | 1.1050                | 1.1050            | 1.1050            | 1.1050               | 1.1050                 |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.933</b>   | <b>0.367</b>   | <b>0.008</b> | <b>0.020</b>    | <b>0.001</b>          | <b>0.0003</b>          | <b>0.001</b>          | <b>0.198</b>      | <b>0.190</b>      | <b>0.031</b>         | <b>0.236</b>           |

### 4.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the RMP, replacement of lighting products with CFLs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, a CFL releases less heat than the less efficient lamp it replaces.

For CFLs, LED lamps and indoor motion sensors, an interactive effects factor of -18.5 percent is used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work done in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2<sup>21</sup> software and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high. The scenario with minimum interactive effects was selected for the calculation because it enabled the Evaluator to account for the evolution of homes since 1992.

The following table presents the calculation details of the interactive effects. It reflects the proportion of residences in Nova Scotia that are heated by electricity<sup>22</sup> and those that have air conditioning units or systems<sup>23</sup>.

**Table 41: Interactive Effects Factor for CFLs, LED Lamps and Indoor Motion Sensors**

| Parameters                                   | % of Residences             | Interactive Effects <sup>24</sup> |
|----------------------------------------------|-----------------------------|-----------------------------------|
| Electric heating with air conditioning       | $33\% \times 18\% = 5.9\%$  | -54.4%                            |
| Electric heating without air conditioning    | $33\% \times 82\% = 27.1\%$ | -58.0%                            |
| No electric heating with air conditioning    | $67\% \times 18\% = 12.1\%$ | 3.6%                              |
| No electric heating without air conditioning | $67\% \times 82\% = 54.9\%$ | 0%                                |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                 | <b>-18.5%</b>                     |

<sup>21</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>22</sup> ENSC, from socket study.

<sup>23</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

<sup>24</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.



Since outdoor motion sensors and heavy duty timers are installed outdoors, no interactive effects factor is calculated on these devices.

For all other products, interactive effects are considered to be negligible. The compressor behind a refrigerator releases heat and the replacement of an old refrigerator with a more efficient unit has an effect on the amount of heat released. However, this effect is reduced when the refrigerator is built-in or leans against an exterior wall. Due to these elements that reduce the interactive effects of a refrigerator replacement and due to the fact that only 33 percent of the houses in Nova Scotia are electrically heated, interactive effects on the purchase of ENERGY STAR refrigerators are not considered in the program net savings calculation.

## **4.4 NET-TO-GROSS RATIO**

For the RMP, the net-to-gross ratio (NTGR) is based on two different approaches:

- > A self-report approach which relies on a series of questions asked during a telephone survey and designed to measure the influence of the discount on customers' decisions to purchase program-eligible energy-efficient products.
- > An approach based on in-depth interviews with retailers to assess the overall influence of the program on their store practices and discuss customer demand and sales of eligible products.

The three most important products in terms of expected savings were targeted for the NTGR calculation: regular CFLs, ENERGY STAR refrigerators and ENERGY STAR clothes washers. All other products, such as dimmer switches, occupancy sensors and power bars with integrated timer, are specialized products which are grouped into larger retail categories making it difficult for retailers to estimate the program influence on their sales. Moreover, the population of buyers for these products is smaller and makes it difficult to reach them using a general population telephone survey. Thus, the distortion effects could not be assessed through this evaluation and a NTGR of 1 is used for all of these remaining products.

Moreover, a NTGR of 1 was used for specialty CFLs sold during the markdown periods or given away through the in-store weekend events. As mentioned in a previous section, the participant survey was targeting CFL buyers in general and, since regular CFLs represent a larger proportion of CFLs sold on the market, the survey results can only be applied to regular CFLs. Specialty CFLs have some particularities, such as higher prices and a lower penetration rate, which prevents the application of a similar NTGR as that applied to regular CFLs.

Finally, for the products sold through the Air Miles pilot project, a NTGR of 1 was used since no specific assessment of free-ridership and spillover was conducted for this special activity.

This section presents the methodology used to transform information obtained through survey and interview questions into a NTGR. For the RMP, the NTGR includes the assessment of two distortion

effects: free-ridership and spillover through market effects. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ spillover})$$

#### **4.4.1 Free-Ridership**

##### **Regular CFLs**

For regular CFLs, the free-ridership level is measured using the participant survey conducted with CFL buyers during either markdown period. The questionnaire included five free-ridership questions that attempted to assess:

- > if the participant had any plans to purchase CFLs before learning about the discount offered;
- > the probability that the participant would have purchased the CFLs if the discount offered had not been in place;
- > the probability that the participant would have purchased the same number of CFLs if the discount offered had not been in place;
- > the quantity of CFLs that the participant would have purchased if the discount offered had not been in place; and
- > the influence of the discount on the participant's decision to purchase CFLs.

Each question is transposed into a level of program attribution which is used to calculate the global free-ridership level for each participant and retailer. The algorithm behind this calculation is presented in Appendix VIII.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania by using:

- > A 0 to 10 scoring system;
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced customer energy efficiency decision making. This question structure reflects the complex nature of the real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Using this approach, survey results reveal a free-ridership level of 78 percent for regular CFLs purchased through the RMP. This relatively high level of free-ridership can be partly explained by the fact that only 17 percent of the participants surveyed were aware that a discount was offered on their purchase of ENERGY STAR CFLs. It means that 83 percent of participants were not aware of the discount when they decided to purchase CFLs, which directly translated into a high level of free-ridership. The "mystery shopper" visits confirmed that the discount offered through the program was hardly visible or that the eligible products were hard to identify. This in turn led to customers never

finding out about the discount or only once they were at the cash register for payment, making it difficult to associate the program influence with their decision to purchase CFLs.

The free-ridership level obtained through the CFL-buyer participant survey was also validated with in-depth interviews with retailers. During these interviews, retailers were asked about the program influence on customer purchases during the markdown periods and the percentage of CFLs that would have been sold in the absence of the discount offered through the program. They estimated that only about 10 percent of their sales of CFLs during the markdown periods were due to the program influence, which confirms the high level of free-ridership measured for CFLs through the participant survey.

Finally, the level of free-ridership from the current evaluation cannot be compared with the evaluation result of last year. In 2010, the approach integrated the sales data provided by the retailers with participant and non-participant survey data to develop estimates of net participant sales that incorporated the effects of free-ridership and spillover in a global NTGR. This year, the free-ridership level was estimated separately from spillover (market effects).

## **Refrigerators and Clothes Washers**

For refrigerators and clothes washers, the approach is somewhat different. As the population of buyers for these two products is small, making it difficult to reach them using a general population telephone survey, the free-ridership level was measured through in-depth interviews with retailers. To do so, the retailers were asked to estimate:

- > the program influence on their customers' purchases during the markdown periods; and
- > the percentage of refrigerators and clothes washers that would have been sold in the absence of the discount offered through the program.

The results are then transposed into a level of free-ridership for each product. The free-ridership level is calculated as 17 percent for CEE Tier 3 ENERGY STAR refrigerators and as 53 percent for CEE Tier 3 ENERGY STAR clothes washers.

These results represent an important diminution in comparison to 2010 results where the free-ridership level was evaluated as 72 percent for ENERGY STAR refrigerators and as 85 percent for ENERGY STAR clothes washers. Two main factors could be responsible for this diminution. In 2011, following a recommendation from the 2010 evaluation, the program raised its target to CEE Tier 3 ENERGY STAR appliances, which probably contributed to a reduction of the free-ridership level. Furthermore, the methodology used to evaluate this distortion effect in 2011 has been modified. The 2010 evaluation established the free-ridership level for the appliances by comparing sales that occurred in 2009, when appliances were not promoted by the RMP, and those achieved in 2010, for the same period of the year. This type of comparison was not possible in 2011 since more than a year was separating the introduction of the appliance component in the RMP and the evaluation period.

Moreover, as in 2010, the evaluation results reveal a higher level of free-ridership for clothes washers than for refrigerators. According to the retailers, there are different factors prevailing during the purchase of a clothes washer that are not necessarily as important during the purchase of a refrigerator. The consumer generally wishes the front load technology because of its look and convenience. This technology is generally more efficient but that decision is not based on energy concerns.

#### 4.4.2 Spillover

RMP discounts are offered during two distinct periods: one in the spring and the other in the fall. During and between these periods, eligible product sales may occur due to program influence, even when participants were not aware of the discount. This influence can come from higher knowledge and awareness of energy-efficient products and from a change in the retailer offer. These sales should be attributable to the program in the form of market effects.

The retailer interviews were used to estimate the level of spillover by measuring the market effects attributable to the program for three eligible products: CFLs, CEE Tier 3 ENERGY STAR refrigerators and CEE Tier 3 ENERGY STAR clothes washers. More specifically, retailers were asked to:

- > rate the influence of the program on their in-store offer, the variety of energy-efficient products available, the knowledge of their salespeople about energy-efficient products and consumer awareness;
- > estimate program attribution for eligible products sold outside of the two markdown periods.

The answers to these questions were analyzed in order to measure the market effects attributable to the program and estimate the spillover effect for each product targeted. The table below presents the results of this analysis.

**Table 42: Spillover**

|                            | <b>2011</b> |
|----------------------------|-------------|
| CFLs                       | 31%         |
| CEE Tier 3 Refrigerators   | 30%         |
| CEE Tier 3 Clothes Washers | 32%         |

The results show that retailers attribute to the program a portion of their sales that are influenced by factors other than the discount. For CFLs, the number of eligible products attributable to general program influence corresponds to 31 percent of the CFLs purchased by participants during the markdown periods. For refrigerators and clothes washers, these sales correspond respectively to 30 and 32 percent of the eligible appliances purchased by participants during the markdown periods.

For CFLs, because the 2010 evaluation calculates free-ridership and spillover effects together, it is impossible to compare spillover with this year's result. In the case of refrigerators and clothes washers, the 2010 evaluation estimated the level of spillover at 0 percent. This was partly due to the fact that spillover was only measured from the end of the markdown period in December 2010 up to the evaluation period in January 2011.

Econoler noticed through retailer interviews that the program had an indirect influence on the market, which cannot be perceived by consumers. For the 2012 evaluation, ENSC should consider increasing the number of retailer interviews. These interviews represent the best tool to capture indirect influences on the market and quantify market effects. Increasing the number of retailer interviews would allow for a more precise quantification of spillover through market effects and could increase the number of products targeted by the assessment of this distortion effect.

The NTGRs resulting from the assessment of free-ridership and spillover for regular CFLs, refrigerators and clothes washers are summarized below.

**Table 43: Net-to-Gross Ratio**

|                                                           | <b>Free-Ridership</b> | <b>Spillover</b> | <b>NTGR</b> |
|-----------------------------------------------------------|-----------------------|------------------|-------------|
| Regular CFLs                                              | 78%                   | 31%              | 0.53        |
| CEE Tier 3 Refrigerators                                  | 17%                   | 30%              | 1.13        |
| CEE Tier 3 Clothes Washers                                | 53%                   | 32%              | 0.79        |
| All Other Products                                        | -                     | -                | 1.00        |
| Products Sold through the Air Miles Pilot Project         | -                     | -                | 1.00        |
| Specialty CFLs Given Away through In-Store Special Events | -                     | -                | 1.00        |

## 4.5 NET SAVINGS

The net energy savings are estimated by adding the interactive effects and the NTGR to the gross savings, based on the equation below.

$$\text{Net Energy Savings} = \text{Gross Energy Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

In the case of the RMP, the net energy savings were first calculated separately for each product because the interactive effects and the NTGR differed from one product to another. Table 44 presents the details of the calculation.

Overall, the total net energy and demand savings amount to 12.490 GWh and 1.257 MW at the meter, and 13.802 GWh and 1.388 MW at the generator.

**Table 44: Evaluation Results – Net Energy and Demand Savings**

| Product Category                                     | Regular CFLs | Specialty CFLs | LED Lamps    | Dimmer Switches | Indoor Motion Sensors | Outdoor Motion Sensors | Power Bars with Timer | Heavy Duty Timers | Prog. Thermostats | Tier 3 Refrigerators | Tier 3 Clothes Washers |
|------------------------------------------------------|--------------|----------------|--------------|-----------------|-----------------------|------------------------|-----------------------|-------------------|-------------------|----------------------|------------------------|
| <b>Energy Savings</b>                                |              |                |              |                 |                       |                        |                       |                   |                   |                      |                        |
| Total gross energy savings – at meter (GWh)          | 8.395        | 3.304          | 0.071        | 0.183           | 0.013                 | 0.003                  | 0.011                 | 1.784             | 1.709             | 0.280                | 2.122                  |
| Interactive effects factor                           | -18.5%       | -18.5%         | -18.5%       | 0%              | 0%                    | 0%                     | 0%                    | 0%                | 0%                | 0%                   | 0%                     |
| NTGR*                                                | 0.53         | 1.00           | 1.00         | 1.00            | 1.00                  | 1.00                   | 1.00                  | 1.00              | 1.00              | 1.13*                | 0.79*                  |
| <b>Total Net Energy Savings (GWh) – at Meter</b>     | <b>4.043</b> | <b>2.693</b>   | <b>0.058</b> | <b>0.183</b>    | <b>0.013</b>          | <b>0.003</b>           | <b>0.011</b>          | <b>1.784</b>      | <b>1.709</b>      | <b>0.317</b>         | <b>1.677</b>           |
| Line loss factor                                     | 1.1050       | 1.1050         | 1.1050       | 1.1050          | 1.1050                | 1.1050                 | 1.1050                | 1.1050            | 1.1050            | 1.1050               | 1.1050                 |
| <b>Total Net Energy Savings (GWh) – at Generator</b> | <b>4.468</b> | <b>2.976</b>   | <b>0.064</b> | <b>0.202</b>    | <b>0.015</b>          | <b>0.003</b>           | <b>0.012</b>          | <b>1.971</b>      | <b>1.888</b>      | <b>0.350</b>         | <b>1.853</b>           |
| <b>Demand Savings</b>                                |              |                |              |                 |                       |                        |                       |                   |                   |                      |                        |
| Total gross demand savings – at meter (MWh)          | 0.845        | 0.332          | 0.007        | 0.018           | 0.001                 | 0.000                  | 0.001                 | 0.179             | 0.172             | 0.028                | 0.214                  |
| Interactive effects factor                           | -18.5%       | -18.5%         | -18.5%       | 0%              | 0%                    | 0%                     | 0%                    | 0%                | 0%                | 0%                   | 0%                     |
| NTGR*                                                | 0.53*        | 1.00           | 1.00         | 1.00            | 1.00                  | 1.00                   | 1.00                  | 1.00              | 1.00              | 1.13*                | 0.79*                  |
| <b>Total Net Demand Savings (MWh) – at Meter</b>     | <b>0.407</b> | <b>0.271</b>   | <b>0.006</b> | <b>0.018</b>    | <b>0.001</b>          | <b>0.000</b>           | <b>0.001</b>          | <b>0.179</b>      | <b>0.172</b>      | <b>0.032</b>         | <b>0.169</b>           |
| Line loss factor                                     | 1.1050       | 1.1050         | 1.1050       | 1.1050          | 1.1050                | 1.1050                 | 1.1050                | 1.1050            | 1.1050            | 1.1050               | 1.1050                 |
| <b>Total Net Demand Savings (MWh) – at Generator</b> | <b>0.449</b> | <b>0.299</b>   | <b>0.006</b> | <b>0.020</b>    | <b>0.001</b>          | <b>0.000</b>           | <b>0.001</b>          | <b>0.198</b>      | <b>0.190</b>      | <b>0.035</b>         | <b>0.186</b>           |

\*To lighten the table, gross savings from CFLs, refrigerators and clothes washers sold during the markdown campaigns and the Air Miles pilot project, as well as from specialty CFLs given away during in-store events, were calculated together. However, for the Air Miles pilot project, a NTGR of 1 was used in the net savings calculation.

The net energy savings resulting from this evaluation were compared to the energy savings from the 2011 tracking sheet as shown in the table below.

**Table 45: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Installed Gross Savings</b> | <b>Installed Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------------------------|---------------------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 16.799 GWh                   | 16.799 GWh                     | 16.799 GWh                                              | 106%        | 17.821 GWh         |
| <b>Evaluation Results</b> | <b>22.555 GWh</b>            | <b>19.752 GWh</b>              | <b>17.346 GWh</b>                                       | <b>80%</b>  | <b>13.802 GWh</b>  |
| <b>Demand Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 1.690 MW                     | 1.690 MW                       | 1.690 MW                                                | 106%        | 1.793 MW           |
| <b>Evaluation Results</b> | <b>2.269 MW</b>              | <b>1.987 MW</b>                | <b>1.745 MW</b>                                         | <b>80%</b>  | <b>1.388 MW</b>    |

The net evaluated savings fell short of those tracked by ENSC by approximately 23 percent. The difference between the evaluated and the tracked savings can be explained by the following factors:

- > Revision of the unitary savings values: For CFLs, LED lamps, programmable thermostats, refrigerators and clothes washers, the unitary savings values were revised upward. For refrigerators and clothes washers, the unitary savings increase is due to the fact that the target was raised to CEE Tier 3 ENERGY STAR models. For CFLs, the unitary savings value went from 41 kWh to 49.8 kWh mainly because of the revision of the daily usage. This increase is not as important as others but had a strong impact on the gross savings due to the important number of CFLs sold during the markdown campaigns. For other products, the unitary savings values remained unchanged.
- > Addition of a replacement ratio and an in-service rate: Econoler took into consideration two phenomena that could have happened after the purchase of regular CFLs: the replacement of CFLs with CFLs, which does not generate any new savings, and the removal of CFLs after their installation. These phenomena were translated into a replacement ratio and an in-service rate, based on the results from the CFL-buyer participant survey. The addition of these parameters allowed for a more precise estimation of the savings generated by regular CFLs.
- > Interactive effects factor: Interactive effects were not taken into account in the tracking sheet. However, Econoler considers that the interactive effects on the heating and cooling loads caused by lighting product replacements are not negligible. Interactive effects factors were estimated for these products and used in the net savings calculations.

- > NTGR: The NTGR was re-evaluated this year for three specific products: regular CFLs, CEE Tier 3 refrigerators and CEE Tier 3 clothes washers. The NTGR included the assessment of two distortion effects: free-ridership and spillover through market effects. In the tracking sheet, ENSC estimated the RMP net savings based on a NTGR of 1.07 for all products. This estimation was very different from the NTGRs of 0.53, 1.13 and 0.79 assessed for regular CFLs, CEE Tier 3 refrigerators and CEE Tier 3 clothes washers, respectively. For the remaining products, Econoler used a NTGR of 1.
- > Line loss factor: In the tracking sheet, ENSC used a line loss factor of 1.1188, as in the 2010 evaluations for residential programs. The line loss factor for the residential sector was updated this year to 1.1050.



## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Document the major characteristics of the program:</b> The justification for deciding to have a two-month event twice a year as well as for selecting the 10 products promoted by the program is not available in the program documents. These are major characteristics of the program and should be documented in the program manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                               | <b>2. Provide a “base case”:</b> The program manual does not provide what we call a “base case” that provides information on how the assumed gross savings were established. Usually, they are calculated with an algorithm using a series of variables. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                               | <b>3. Provide the parameters used to estimate the program objectives:</b> After having <b>estimated</b> the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. Moreover, the parameters should be continually adjusted based on the most recent evaluation results. |
|                               | <b>4. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes. Additionally, our recommendation is to <b>consider</b> the product specifications in the development of the marketing strategy, which include relative advantage, compatibility, complexity, trialability and observability. These five characteristics are what consumers usually relate to when purchasing any goods. Focusing the marketing messages on these characteristics could be a strong argument to convince consumers to acquire them.                                         |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>5. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing to serve as “<b>program memory</b>” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Program Tracking Sheet</b> | <p><b>6. Monitor the energy savings in the tracking sheet:</b> The estimated gross savings should be computed in the tracking sheet. To do so, ENSC should add a table with the unitary savings values for each product and calculate the savings in the tracking sheet with a formula referring to the values in the unitary savings table.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                               | <p><b>7. Keep track of the manipulation made for calculating the number of units:</b> For products sold in packages, the tracking sheet only contains the information on the quantity of units. It would be <b>preferable</b> to keep track of all the information used to convert the number of packages into a number of units. Furthermore, as the discounts are provided by package and not by unit, it would make the tracking of the discounts offered through the program easier. There is no field directly providing the total discount amount offered by ENSC and it is not possible to reconstitute this information because the number of packages is not available in the tracking sheet.</p>                                                                                    |
|                               | <p><b>8. Include technical information in the tracking sheet:</b> For evaluation purposes, technical <b>information</b> on products could be useful to estimate the unitary savings of products. For that reason, Econoler suggests including all the technical information provided by the retailers, such as lamp wattage and product descriptions, in the tracking sheet.</p>                                                                                                                                                                                                                                                                                                                                                                                                              |
|                               | <p><b>9. Use relevant titles:</b> Finally, it is recommended that ENSC always use titles that reveal the content of the field. For example, the field called “CFL Type” should be changed to “Product Category” as it does not contain information on CFLs only.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                               | <p><b>10. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b> | <p><b>11. Standardize the program name across all channels:</b> To avoid confusion, and to ensure adequate evaluation and tracking, the program name should always be the same whether it is for administrative reasons for ENSC (currently designated as the Retail Markdown Program) or for marketing purposes (it runs under the name “Plug Into Savings” in the program literature and in the market). In the past, the program was marketed under the name “Power Down.” Econoler understands that ENSC is a new organization and therefore wants to develop its presence in the market, but changing names should be kept to a minimum. The program name should reflect as much as possible the nature of the program.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                               | <p><b>12. Analyze the market offer in order to adjust the discounted products:</b> Gradually, the in-store offers for the products supported by this program will increase and the unit price will decrease along with the discounts until the market reaches a level of penetration where there is no need for discounts. For this kind of program, the Evaluator recommends observing the evolution of the in-store offer. This will provide key information to the PM to adjust the discounts downward as each category of product increases its penetration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                               | <p><b>13. Consider conducting exit surveys:</b> The challenge of the Evaluator for such a program lies in the fact that participants are unknown and it is necessary to survey a large number of consumers to find an adequate sample of participants. Even then, a portion of these participants may be unaware or have forgotten that there was a discount in their purchase, making the mass survey an imprecise tool for monitoring the market. An exit survey, which consists of in-store intercept interviews with people who have just completed their purchases, could solve part of this problem. The exit survey would allow pinpointing the buyers of all eligible products during the promotional periods and collecting feedback on program influence. Moreover, interviewing participants right after their purchase could result in a lower free-ridership level since participants will have better recollection of the discount offered and the level of influence it had on their purchase. Additionally, other relevant information for the impact evaluation could be assessed during these exit surveys. For instance, an exit survey targeting thermostat buyers would allow collecting information on the housing type and the main source of energy they use.</p> |
|                               | <p><b>14. Continue to upgrade eligible discounted appliances:</b> In order to reduce free-ridership rates, the program should continue to upgrade the admissible tiers of the discounted appliances set by the Consortium for Energy Efficiency (CEE). However, gross savings will be lower since a dynamic baseline is used (the baseline will be higher).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On-Site Visits</b>             | <p><b>15. Support independent stores with their promotional displays:</b> Moreover, highly deficient promotional displays were found in a couple of stores, including one independent retailer. This issue was brought up by one of the retailers contacted during the in-depth interviews. They mentioned that it was very difficult for smaller or independent stores to coordinate the efforts necessary to their participation in the program since they had not gotten any help from the head office. This goes to show that the smaller regional or independent stores may need the support of the DA to participate in the RMP.</p> |
|                                   | <p><b>16. Improve visibility of discounted products:</b> The discounts offered under the RMP were not always clearly identified during on-site visits. Moreover, some salespeople were unable to identify the discount amount even when referring to the prices listed on the shelves or the products. This emphasizes the importance of improving the visibility of the discount amount signage.</p>                                                                                                                                                                                                                                      |
| <b>Relationship with Partners</b> | <p><b>17. Improve program marketing and advertising:</b> One retailer found the marketing, more specifically the posters, to be confusing because of the different discounts offered. The marketing tools were not customized to the different products promoted through the program. Another retailer pointed out that the signage was too generic and therefore not easily adaptable to each store. Finally, one retailer suggested rethinking the marketing for it to be more customer-oriented, meaning that it should be more “eye-catching,” yet still informative.</p>                                                              |
|                                   | <p><b>18. Limit the number of people involved in the communications:</b> The retailers were very satisfied with program support and communication. However, in order to make it even better, one retailer suggested limiting the number of people involved in the communications and using the same channel to communicate. Moreover, they recommended informing the retailers in advance of all promotions or events to come.</p>                                                                                                                                                                                                         |
|                                   | <p><b>19. Add products to the list of products promoted through the program:</b> Most of the retailers mentioned being satisfied with the products promoted through the program. However, some retailers recommended adding products to the list such as weather proofing products, light fixtures, power bars with auto shut-off and ENERGY STAR televisions. Another interviewee thinks that the product list should include more construction products, such as window wraps, windows, doors and pipe wraps.</p>                                                                                                                        |
|                                   | <p><b>20. Continue weekend events and perform marketing pulse:</b> Periodic discounts, rather than year-round discounts, are favoured by the DA and retailers in order to create a buzz and maintain customer interest. In that line of thought, the concept of weekend events was mentioned as being very positive. It is to be noted that ENSC will conduct a 10-month campaign in 2012, which will include marketing pulse.</p>                                                                                                                                                                                                         |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relationship with Partners</b> | <p><b>21. Offer more training and support to retailers:</b> One retailer wishes to see more training offered to the salespeople. According to them, ENSC's sales representatives could visit the stores before the markdown periods to inform the staff of the products promoted through the program, their advantages and main characteristics. The sales representatives could use that opportunity to make sure that all marketing tools are well installed. Furthermore, another retailer thinks that more awareness and education need to be made with respect to CEE Tier 3 products.</p>                                                            |
| <b>Impact Evaluation</b>          | <p><b>22. Increase the number of retailer interviews:</b> Econoler noticed through retailer interviews that the program had an indirect influence on the market, which cannot be perceived by consumers. For the 2012 evaluation, ENSC should consider increasing the number of retailer interviews. These interviews represent the best tool to capture indirect influences on the market and quantify market effects. Increasing the number of retailer interviews would allow for a more precise quantification of spillover through market effects and could increase the number of products targeted by the assessment of this distortion effect.</p> |

## APPENDIX II – DEMOGRAPHICS

Similar to previous years, most participants and non-participants own their home.

**Table 46: Home Ownership Status – 2011**

|                                      | Participants | Non-Participants | Total (Weighted) | Census  |
|--------------------------------------|--------------|------------------|------------------|---------|
| <i>Sample Size</i>                   | 70           | 70               | 140              | 376,845 |
| Own                                  | 89%          | 84%              | 86%              | 72%     |
| Rent                                 | 11           | 16               | 14               | 28      |
| Don't know/refused responses removed |              |                  |                  |         |

**Table 47: Home Ownership Status – 2008 to 2010**

|                    | 2008         |                  |       | 2009         |                  |       | 2010         |                  |       |
|--------------------|--------------|------------------|-------|--------------|------------------|-------|--------------|------------------|-------|
|                    | Participants | Non-Participants | Total | Participants | Non-Participants | Total | Participants | Non-Participants | Total |
| <i>Sample Size</i> | 60           | 70               | 130   | 68           | 70               | 138   | 70           | 70               | 140   |
| Own                | 93%          | 87%              | 88%   | 91%          | 93%              | 92%   | 96%          | 83%              | 87%   |
| Rent               | 7            | 13               | 12    | 9            | 7                | 8     | 4            | 17               | 13    |

The majority of participants (79%) and non-participants (79%) live in single family detached homes, which is similar to previous findings.

**Table 48: Type of Residence – 2011**

|                                        | Participants | Non-Participants | Total (Weighted) | Census  |
|----------------------------------------|--------------|------------------|------------------|---------|
| <i>Sample Size</i>                     | 71           | 70               | 141              | 376,845 |
| Single family detached                 | 79%          | 79%              | 79%              | 67%     |
| Semi-detached                          | 7            | 1 <sup>Ω</sup>   | 4                | 5       |
| Townhouse or duplex                    | 1            | 4                | 3                | 3       |
| Row house                              | 4            | 0                | 2                | 2       |
| Apartment with fewer than five stories | 4            | 10               | 8                | 15      |
| Mobile home or house trailer           | 3            | 1                | 2                | 4       |
| Apartment with more than five stories  | 1            | 3                | 2                | 4       |
| Other                                  | 0            | 1                | 1                | 0       |

**Table 49: Type of Residence – 2008 to 2010**

|                                        | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|----------------------------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                                        | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) |
| <i>Sample Size</i>                     | 60           | 70               | 130              | 69           | 69               | 138              | 70           | 70               | 140              |
| Single family detached                 | 90%          | 70%              | 73%              | 93%          | 86%              | 69%              | 83%          | 86%              | 85%              |
| Semi-detached                          | 2            | 7                | 7                | 0            | 4                | 7                | 7            | 3                | 4                |
| Townhouse or duplex                    | 5            | 10               | 9                | 1            | 3                | 10               | 3            | 0                | 1                |
| Row house                              | 0            | 3                | 3                | 0            | 0                | 0                | 1            | 0                | 0                |
| Apartment with fewer than five stories | 3            | 7                | 7                | 3            | 3                | 11               | 1            | 6                | 4                |
| Mobile home or house trailer           | 0            | 3                | 3                | 1            | 4                | 3                | 1            | 3                | 2                |
| Apartment with more than five stories  | 0            | 0                | 0                | 0            | 0                | 0                | 0            | 1                | 1                |
| Tent home                              | 0            | 0                | 0                | 1            | 0                | <1               | 2            | 1                | 1                |

The majority of participants (78%) and non-participants (73%) live in homes with three or more bedrooms.

**Table 50: Number of Bedrooms – 2011**

|                    | Participants | Non-Participants | Total (Weighted) |
|--------------------|--------------|------------------|------------------|
| <i>Sample Size</i> | 71           | 70               | 141              |
| 1                  | 3%           | 6%               | 5%               |
| 2                  | 18           | 21               | 20               |
| 3                  | 46           | 49               | 48               |
| 4 or more          | 32           | 24               | 27               |

**Table 51: Number of Bedrooms – 2008 to 2010**

|                    | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|--------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                    | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) |
| <i>Sample Size</i> | 60           | 70               | 130              | 70           | 70               | 140              | 70           | 70               | 140              |
| 1                  | 2%           | 4%               | 4%               | 3%           | 7%               | 13%              | 3%           | 3%               | 3%               |
| 2                  | 12           | 23               | 22               | 19           | 19               | 20               | 13           | 14               | 14               |
| 3                  | 63           | 41               | 44               | 46           | 51               | 48               | 57           | 54               | 55               |
| 4 or more          | 23           | 31               | 2                | 32           | 23               | 19               | 27           | 29               | 28               |

Participants have a higher household income than non-participants, with 57 percent of participants reporting an annual household income of \$50,000 or more, compared with 48 percent of non-participants.

**Table 52: Annual Income – 2011**

|                                                 | Participants | Non-Participants | Total (Weighted) | Census  |
|-------------------------------------------------|--------------|------------------|------------------|---------|
| <i>Sample Size</i>                              | 60           | 59               | 119              | 376,845 |
| Less than \$15,000                              | 5%           | 5%               | 5%               | 5%      |
| \$15,000 to \$24,999                            | 10           | 14               | 12               | 8       |
| \$25,000 to \$34,999                            | 13           | 12               | 12               | 12      |
| \$35,000 to \$49,999                            | 15           | 20               | 18               | 17      |
| \$50,000 to \$69,999                            | 20           | 20               | 20               | 20      |
| \$70,000 to \$79,999                            | 5            | 3                | 4                | 8       |
| \$80,000 or more                                | 32           | 25               | 28               | 29      |
| Don't know/refused responses removed from table |              |                  |                  |         |



**Table 53: Annual Income – 2008 to 2010**

|                      | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|----------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                      | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) | Participants | Non-Participants | Total (Weighted) |
| <i>Sample Size</i>   | 50           | 57               | 107              | 53           | 53               | 106              | 61           | 56               | 117              |
| Less than \$15,000   | 4%           | 18%              | 16%              | 4%           | 8%               | 12%              | 5%           | 11%              | 9%               |
| \$15,000 to \$24,999 | 8            | 18               | 17               | 9            | 11               | 19               | 10           | 11               | 11               |
| \$25,000 to \$34,999 | 10           | 12               | 12               | 19           | 26               | 24               | 7            | 18               | 14               |
| \$35,000 to \$49,999 | 24           | 21               | 22               | 17           | 17               | 13               | 20           | 27               | 25               |
| \$50,000 to \$69,999 | 18           | 7                | 8                | 26           | 15               | 15               | 21           | 9                | 13               |
| \$70,000 to \$79,999 | 12           | 9                | 9                | 2            | 2                | 1                | 13           | 7                | 9                |
| \$80,000 or more     | 24           | 16               | 17               | 23           | 21               | 16               | 25           | 18               | 20               |

The average number of full time residents by household is 2.5 for participants and 2.4 for non-participants.

**Table 54: Number of Full Time Residents – 2011**

|                                                  | Participants | Non-participants | Total (Weighted) |
|--------------------------------------------------|--------------|------------------|------------------|
| <i>Sample Size</i>                               | 70           | 70               | 140              |
| 1                                                | 19%          | 23%              | 21%              |
| 2                                                | 43           | 39               | 40               |
| 3                                                | 20           | 21               | 21               |
| 4                                                | 14           | 13               | 13               |
| 5 or more                                        | 4            | 4                | 4                |
| Average                                          | 2.5          | 2.4              | 2.4              |
| *Don't know/refused responses removed from table |              |                  |                  |

**Table 55: Number of Full Time Residents – 2008 to 2010**

|                    | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|--------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                    | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) |
| <i>Sample Size</i> | 60           | 70               | 130              | 67           | 69               | 136              | 69           | 69               | 138              |
| 1                  | 15%          | 21%              | 20%              | 7%           | 13%              | 14%              | 15%          | 12%              | 13%              |
| 2                  | 43           | 44               | 43               | 51           | 57               | 51               | 38           | 54               | 49               |
| 3                  | 22           | 16               | 16               | 15           | 10               | 14               | 30           | 19               | 22               |
| 4                  | 13           | 11               | 11               | 18           | 16               | 13               | 13           | 10               | 11               |
| 5 or more          | 7            | 7                | 7                | 9            | 4                | 8                | 4            | 5                | 5                |
| Average            | 2.5          | 2.5              | 2.5              | 2.7          | 2.4              | 2.6              | 2.6          | 2.5              | 2.5              |

All participants (100%) and the majority of non-participants (90%) reported that they were responsible for paying their electric bills, which is similar to results from past studies.

**Table 56: Responsible for Electric Bill – 2011**

|                    | Participants | Non-participants | Total (Weighted) |
|--------------------|--------------|------------------|------------------|
| <i>Sample Size</i> | 71           | 70               | 141              |
| Yes                | 100%         | 90%              | 94%              |
| No                 | 0            | 10               | 6                |

**Table 57: Responsible for Electric Bill – 2008 to 2010**

|                    | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|--------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                    | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) |
| <i>Sample Size</i> | 60           | 70               | 130              | 70           | 70               | 140              | 70           | 70               | 140              |
| Yes                | 95%          | 89%              | 90%              | 94%          | 93%              | 82%              | 96%          | 94%              | 95%              |
| No                 | 5            | 11               | 10               | 6            | 7                | 18               | 4            | 6                | 5                |

Participants and non-participants had similar age distributions. The majority of respondents are at least 35 years of age (87% for participants and 89% for non-participants).

**Table 58: Respondent Age – 2011**

|                    | <b>Participants</b> | <b>Non-participants</b> | <b>Total (Weighted)</b> |
|--------------------|---------------------|-------------------------|-------------------------|
| <i>Sample Size</i> | <i>71</i>           | <i>70</i>               | <i>141</i>              |
| 18 to 24           | 3%                  | 1%                      | 2%                      |
| 25 to 34           | 10                  | 10                      | 10                      |
| 35 to 44           | 18                  | 17                      | 18                      |
| 45 to 54           | 27                  | 26                      | 26                      |
| 55 to 64           | 27                  | 19                      | 22                      |
| 65 or older        | 15                  | 27 <sup>Ω</sup>         | 23                      |

**Table 59: Respondent Age – 2008 to 2010**

|                    | <b>2008</b>         |                         |                         | <b>2009</b>         |                         |                         | <b>2010</b>         |                         |                         |
|--------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|
|                    | <b>Participants</b> | <b>Non-participants</b> | <b>Total (Weighted)</b> | <b>Participants</b> | <b>Non-participants</b> | <b>Total (Weighted)</b> | <b>Participants</b> | <b>Non-participants</b> | <b>Total (Weighted)</b> |
| <i>Sample Size</i> | <i>60</i>           | <i>70</i>               | <i>130</i>              | <i>67</i>           | <i>69</i>               | <i>136</i>              | <i>67</i>           | <i>67</i>               | <i>135</i>              |
| 18 to 24           | 8%                  | 6%                      | 6%                      | 6%                  | 0%                      | 1%                      | 3%                  | 3%                      | 3%                      |
| 25 to 34           | 17                  | 9                       | 10                      | 9                   | 9                       | 11                      | 15                  | 9                       | 11                      |
| 35 to 44           | 13                  | 10                      | 10                      | 7                   | 14                      | 10                      | 22                  | 15                      | 17                      |
| 45 to 54           | 28                  | 24                      | 24                      | 33                  | 23                      | 29                      | 19                  | 22                      | 21                      |
| 55 to 64           | 18                  | 33                      | 31                      | 33                  | 17                      | 16                      | 21                  | 27                      | 25                      |
| 65 or older        | 15                  | 19                      | 18                      | 12                  | 36                      | 32                      | 19                  | 24                      | 22                      |

Over one-half of participants have a college or university degree (56%), and 49 percent of non-participants have a college or university degree.

**Table 60: Education Level – 2011**

|                                                  | Participants | Non-participants | Total (Weighted) | Census  |
|--------------------------------------------------|--------------|------------------|------------------|---------|
| <i>Sample Size</i>                               | 71           | 69               | 140              | 266,000 |
| Less than high school                            | 15%          | 12%              | 13%              | 27%     |
| High school graduate                             | 18           | 30 <sup>o</sup>  | 26               | 23      |
| Trade certificate                                | 10           | 9                | 9                | 12      |
| College diploma                                  | 10           | 16               | 14               | 18      |
| University diploma                               | 46           | 33               | 38               | 16      |
| *Don't know/refused responses removed from table |              |                  |                  |         |

**Table 61: Education Level – 2008 to 2010**

|                    | Participants | Non-participants | Total (Weighted) |
|--------------------|--------------|------------------|------------------|
| <i>Sample Size</i> | 71           | 70               | 141              |
| Female             | 59%          | 54%              | 56%              |
| Male               | 41           | 46               | 44               |

**Table 62: Respondent Gender – 2008 to 2010**

|                    | 2008         |                  |                  | 2009         |                  |                  | 2010         |                  |                  |
|--------------------|--------------|------------------|------------------|--------------|------------------|------------------|--------------|------------------|------------------|
|                    | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) | Participants | Non-participants | Total (Weighted) |
| <i>Sample Size</i> | 60           | 70               | 130              | 70           | 71               | 141              | 70           | 70               | 140              |
| Female             | 52%          | 56%              | 55%              | 57%          | 69%              | 69%              | 61%          | 51%              | 54%              |
| Male               | 48           | 44               | 44               | 43           | 31               | 31               | 39           | 49               | 46               |

## **APPENDIX III - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Retail Markdown Program**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) to be discussed:

|                                                                                           |
|-------------------------------------------------------------------------------------------|
| <b>Source: The 2010 Evaluation report by NMR. (E-2-1 NAS evaluation reports 2010.pdf)</b> |
|-------------------------------------------------------------------------------------------|

Q: Page I. Who are the implementation contractors? Is it Summerhill? If yes what is his role? (The role part is very important to help us formulating the appropriate questions for the process evaluation with the contractor)

Q: In this program how do you call your partners? contractors, delivery agent? other?

Q: Page III What is the status of NMR recommendations to mitigate the impact of the pending removal of regular CFLs. (7 bullets)?

C: Are you expecting any hoarding or technology dumping because of the new regulation about eliminating incandescent lamps?

Q: On page V, there are two very good recommendations about the Tier 3 appliances and the year round program. What is the status of these recommendations?

Q: On page V, We would like to know the status of the following recommendation:

R1

R3

#### **Page VI – Status on recommendations**

R6

#### **Page VII**

R2

**Page VIII**

R2

**Page 5 CFL Logic model:**

Q: Does this Logic Model needs updating? We don't think so.

Q: Who provides the training for the retailers (in the outputs)?

C: We don't see any delivery agent in this LM.

C: Is there any participation process flow chart? If not is it because it's a rather simple process especially for the participant

C: Pages 4 and 8, Logic models: The program needs only 2 logic models one for all products except the appliances and one for the appliances. They don't seem to need any updating. If the CFL logic model in adjusted, it will have to be adjusted for the other measures as wee.

C: (We were able to print the program description from the Web site just before it disappears – we guess because the period was over? Yes?)

|                                                          |
|----------------------------------------------------------|
| <b>Source: Program Manual, June 24, 2011 version 1.1</b> |
|----------------------------------------------------------|

**Page 9**

Q: The program changed names several times (Plug Down, Plug Into Savings, Power Down Program and Retail Markdown Program). Care to comment on this particular aspect of changing names that looks like it's a common practice for a lot of ENSC programs.

Q: The program last only 2 month at a time twice a year. What is the rationale behind the two short periods?

**Page 10**

Q: Who provide the associate training?

Q: The delivery agent? Is the same as the implementation contractor? If yes why do we use different names?

C: The socket study is a very good initiative, especially when we are in a market transformation mode.

Q: Again at the program activities section we have educate sales person and educational events, it's not clear who provide these activities? Do you keep tracking of these activities (performance indicators) and is there any evaluation form the trainees fill out after each session?

**Page 12**

Q: The customer who fills out the coupon (for the RMP who cannot integrate the discount in their cash machines) sends it to whom? The delivery agent?

Q: For those who uses the coupon is there a 1-800 number for customer service, in case there are delays or he does not get his discount?

**Page 15**

Q: We take it that these are gross effects without interactive effects that were calculated in the last evaluation.

Q: Do you have any details as for the origin of these savings and what variables they included?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Did the program design foresee any distortion effects (free-riders, spill-over, interactive effects, etc.) for some of the program products?

Q: was there any particular reason for selecting the 10 measures? And who selected them?

Q: what was the main barrier for customers to acquire these products (when you designed the program)?

Q: Do you perform a post-cost effectiveness test after each evaluation? And if not why?

Q: was there an evaluation plan when this program was first designed?

Q: Does your marketing and outreach strategy include the retailers (for market pull) as well as the traditional communication tools for market push?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

Thank you

---

## **APPENDIX IV - INTERVIEW GUIDE WITH DELIVERY AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Retail Markdown Program**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know



**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was the complaint about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Retail Markdown Program**

**Q9 – We would like your opinion on the number of retailers involved in this program.**

**Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the participant retailers?**

**Score:**

**Q10a – If your answer to Q10 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participant retailers?**

☐ Not applicable

**Q12- In delivering the program, did you experience or witness any confusion in the market among the participant retailers?**

**Q13- What is your opinion in regard to the program name that has changed many times since its first implementation (Power Down, Plug into Savings and now Retail Markdown Program)?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name (e.g., the products covered by each markdown period, the number of retailers, etc.)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion

**Q15- What is your opinion regarding the duration of the program (two-month period twice a year vs. year-round)?**

**Q16- Do you think that marked down products should be promoted at a particular time of the year where sales are at their highest?**

- ☐ Yes
- ☐ No
- ☐ No opinion

**Q17- Would you say that collecting data from participant retailers is done:**

- ☐ In a timely fashion
- ☐ With some delays

**Q18- Did you receive any complaints from the participant retailers?**

☐ Yes

☐ No

**Q18a- What was the complaint about?**

**Q19 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

---

## **APPENDIX V - INTERVIEW GUIDE WITH RETAILER PARTNERS**

### **CORPORATE RETAILER INTERVIEW GUIDE**

#### **ENSC RETAIL MARKDOWN PROGRAM**

October 26, 2011

Hello, may I please speak with \_\_\_\_\_?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

#### **INTRODUCTION**

Hello, my name is \_\_\_\_\_, from Econoler. I am calling on behalf of Efficiency Nova Scotia Corporation for the Retail Markdown Program.

[TO BE READ IF NECESSARY]

The program was formerly known as the “Power Down” program. Throughout the interview, I will refer to it as the “Retail Markdown” program.

#### **IDENTIFICATION AND SCREENING OF RESPONDENT**

- I1. According to our records, your company has participated in the Retail Markdown Program from Efficiency Nova Scotia. Econoler has been mandated by Efficiency Nova Scotia to conduct an evaluation of this program. We have a few questions about your company’s participation in this program. Specifically, I’d like to speak with someone from the head office who is knowledgeable about the stocking and supplying of products that were discounted by the program. These products include ENERGY STAR CFLs, refrigerators and clothes washers. Would that person be you?

\_Person responsible available [CONTINUE TO I2]

\_Person responsible currently unavailable [ARRANGE CALL BACK WITH THE RIGHT PERSON]

\_No person responsible for stocking or management of products [CONTINUE INTERVIEW WITH CORPORATE MANAGER - CONTINUE TO I2]

\_Don't know [CONTINUE INTERVIEW WITH CORPORATE MANAGER - CONTINUE TO I2]

\_Refused [THANK AND TERMINATE]

### **Confidentiality**

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses.

### **Recording of the Interview**

Please note that the interview will be recorded for transcription purposes only. The recording will remain strictly confidential.

I2. What is your job title?

-----

### **VERIFICATION OF PRODUCTS FROM DATABASE**

VP1. From the database, check the products that received the Retail Markdown discount for each period and validate the information with the interviewee.

|                             | May-June Period          | October-November Period  |
|-----------------------------|--------------------------|--------------------------|
| ENERGY STAR CFLs            | <input type="checkbox"/> | <input type="checkbox"/> |
| ENERGY STAR Refrigerators   | <input type="checkbox"/> | <input type="checkbox"/> |
| ENERGY STAR Clothes Washers | <input type="checkbox"/> | <input type="checkbox"/> |

**ASK IF ENERGY STAR CFLs WERE REBATED THROUGH THE PROGRAM – ASK DEPENDING ON WHICH MARKDOWN PERIOD(S) THE CORPORATE RETAILER PARTICIPATED IN**

## ENERGY STAR CFLs

C1. I now have a few questions about your sales of ENERGY STAR CFLs. Please note that we are considering here regular CFLs as well as specialty CFLs.

We would like to know your approximate sales volume for ENERGY STAR CFLs for both 2011 Markdown periods and for 2011 altogether [IF RESPONDENT CANNOT ANSWER FOR ENERGY STAR CFLs, ASK FOR ALL CFLs).

- A. According to our information, you sold \_\_\_\_\_ ENERGY STAR CFLs DURING the Markdown promotion in May and June? Is this accurate?
- B. Do you think that your sales of ENERGY STAR CFLs from the Markdown period currently in effect will be the same as your sales from the May-June Markdown period? If not, will they be higher or lower? Can you give me an estimate? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]
- C. Roughly, how many ENERGY STAR CFLs do you think you will sell in 2011 outside of the two Markdown periods /or what percentage of your 2011 sales approximately will occur during the two Markdown periods/or how many ENERGY STAR CFLs do you expect to sell in 2011?

Is your answer based on a number of units or a number of packs?

[IF ANSWER IS A NUMBER OF CFL PACKS, ASK HOW MANY CFLs IN AVERAGE ARE IN EACH PACK]

C2. During the May-June promotion, the Markdown program provided a discount of \$3 or \$5 (depending on the size of the pack) for each pack of ENERGY STAR CFLs sold in your stores. If this discount had not been available, do you think that your May-June sales of ENERGY STAR CFLs would have been about the same, lower or higher?

- ☐ Same [SKIP TO C2b]
- ☐ Lower
- ☐ Higher [SKIP TO C2b]
- ☐ Don't know [SKIP TO C3]
- ☐ Refused [SKIP TO C3]



C2a. By what percentage do you estimate your stores' sales of ENERGY STAR CFLs would have been lower during the May-June promotion period if the discount had not been available?

RECORD PERCENTAGE \_\_\_\_%

C2b. By answering that your sales would have been the same without the discount, do you mean that the program had no influence on your sales of CFLs?

☐ Yes, the program had no influence on my sales [GO TO C3]

☐ No, the program did have an influence on my sales [GO BACK TO C2a]

☐ Don't know [GO TO C3]

☐ Refused [GO TO C3]

C3. Do you think that your October-November sales of ENERGY STAR CFLs will be about the same, lower or higher than they would have been without the discount offered?

☐ Same [SKIP TO C4]

☐ Lower

☐ Higher [SKIP TO C4]

☐ Don't know [SKIP TO C4]

☐ Refused [SKIP TO C4]

C3a. By what percentage do you estimate your stores' sales of ENERGY STAR CFLs would be lower during the October-November promotion period if the discount was not available? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]

RECORD PERCENTAGE \_\_\_\_%

[IF DIFFERENT FROM C2a, ASK WHY]

C4. During the May-June promotion period, besides the Markdown program discounts, were there any other discounts provided on CFLs?

☐ Yes [GO TO C4a]

☐ No [GO TO C5]

☐ Don't know [GO TO C5]

☐ Refused [GO TO C5]

C4a. Who offered the discount(s) and what was the value of the discount(s)?

☐ Store \$ \_\_\_\_\_

☐ Manufacturer1 (specify) \$ \_\_\_\_\_

☐ Manufacturer2 (specify) \$ \_\_\_\_\_

☐ Natural Resources Canada \$ \_\_\_\_\_

☐ Other Federal Government \$ \_\_\_\_\_

☐ Provincial Government \$ \_\_\_\_\_

☐ City/Town/Municipality \$ \_\_\_\_\_

☐ Other \$ \_\_\_\_\_

☐ Don't know

☐ Refused

C5. During the October-November promotion period currently in effect, besides the Markdown program discounts, are there any other discounts provided on CFLs?

☐ Yes [GO TO C5a]

☐ No [GO TO C6]

☐ Don't know [GO TO C6]

☐ Refused [GO TO C6]

C5a. Who offers the discount(s) and what is the value of the discount(s)?

- ☐ Store \$ \_\_\_\_\_
- ☐ Manufacturer1 (specify) \$ \_\_\_\_\_
- ☐ Manufacturer2 (specify) \$ \_\_\_\_\_
- ☐ Natural Resources Canada \$ \_\_\_\_\_
- ☐ Other Federal Government \$ \_\_\_\_\_
- ☐ Provincial Government \$ \_\_\_\_\_
- ☐ City/Town/Municipality \$ \_\_\_\_\_
- ☐ Other \$ \_\_\_\_\_
- ☐ Don't know
- ☐ Refused

C6. How influential was the Retail Markdown program on each of the following aspects of your stores? Please answer using a scale where 0 means "Not at all influent" and where 10 means "Very influent".

a. Your stores offer of CFLs

Scale:

b. The knowledge of your salespersons with regard to CFLs

Scale:

c. The knowledge of consumers with regard to CFLs

Scale:

d. The variety of CFLs offered in your stores

Scale:

- C7. What percentage of your sales of CFLs outside of the two markdown periods do you attribute to the program (or think occurred because of the program)? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION] [IF THE RESPONDENT HAS DIFFICULTY PROVIDING AN EXACT PERCENTAGE, ASK FOR A RANGE]

Enter %:

**ASK IF ENERGY STAR REFRIGERATORS WERE REBATED THROUGH THE PROGRAM – ASK  
DEPENDING ON WHICH MARKDOWN PERIOD(S) THE RETAILER PARTICIPATED IN**

**ENERGY STAR Refrigerators**

- R1. I now have a few questions about your sales of ENERGY STAR refrigerators.

We would like to know your approximate sales volume for ENERGY STAR refrigerators for both 2011 Markdown periods and for 2011 altogether.

- A. According to our information, you sold \_\_\_\_\_ ENERGY STAR refrigerators DURING the Markdown promotion in May and June? Is this accurate?
- B. Do you think that your sales of ENERGY STAR refrigerators from the Markdown period currently in effect will be the same as your sales from the May-June Markdown period? If not, will they be higher or lower? Can you give me an estimate? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]
- C. Roughly, how many ENERGY STAR refrigerators do you think you will sell in 2011 outside of the two Markdown periods/or what percentage of your 2011 sales approximately will occur during the two Markdown periods/or how many ENERGY STAR refrigerators do you expect to sell in 2011?

R2. During the May-June promotion, the Markdown program provided a discount of \$100 for each ENERGY STAR refrigerator sold in your stores. If this discount had not been available, do you think that your May-June sales of ENERGY STAR refrigerators would have been about the same, lower or higher?

☐ Same [SKIP TO R3]

☐ Lower

☐ Higher [SKIP TO R3]

☐ Don't know [SKIP TO R3]

☐ Refused [SKIP TO R3]

R2a. By what percentage do you estimate your stores' sales of ENERGY STAR refrigerators would have been lower during the May-June promotion period if the discount had not been available?

RECORD PERCENTAGE \_\_\_\_%

R2b. By answering that your sales would have been the same without the discount, do you mean that the program had no influence on your sales of ENERGY STAR refrigerators?

☐ Yes, the program had no influence on my sales [GO TO R3]

☐ No, the program did have an influence on my sales [GO BACK TO R2a]

☐ Don't know [GO TO R3]

☐ Refused [GO TO R3]

R3. Do you think that your October-November sales of ENERGY STAR refrigerators will be about the same, lower or higher than they would have been without the discount offered?

☐ Same [SKIP TO R4]

☐ Lower

☐ Higher [SKIP TO R4]

☐ Don't know [SKIP TO R4]

☐ Refused [SKIP TO R4]

R3a. By what percentage do you estimate your stores' sales of ENERGY STAR refrigerators would be lower during the October-November promotion period if the discount was not available?  
[SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]

RECORD PERCENTAGE \_\_\_\_%

IF DIFFERENT FROM R2a, ASK WHY

R4. During the May-June promotion period, besides the Markdown program discounts, were there any other discounts provided on ENERGY STAR refrigerators?

☐ Yes [GO TO R4a]

☐ No [GO TO R5]

☐ Don't know [GO TO R5]

☐ Refused [GO TO R5]

R4a. Who offered the discount(s) and what was the value of the discount(s)?

☐ Store \$ \_\_\_\_\_

☐ Manufacturer1 (specify) \$ \_\_\_\_\_

☐ Manufacturer2 (specify) \$ \_\_\_\_\_

☐ Natural Resources Canada \$ \_\_\_\_\_

☐ Other Federal Government \$ \_\_\_\_\_

☐ Provincial Government \$ \_\_\_\_\_

☐ City/Town/Municipality \$ \_\_\_\_\_

☐ Other \$ \_\_\_\_\_

☐ Don't know

☐ Refused

R5. During the October-November promotion period currently in effect, besides the Markdown program discounts, are there any other discounts provided on ENERGY STAR refrigerators?

☐ Yes [GO TO R5a]

☐ No [GO TO R6]

☐ Don't know [GO TO R6]

☐ Refused [GO TO R6]

R5a. Who offers the discount(s) and what is the value of the discount(s)?

☐ Store \$ \_\_\_\_\_

☐ Manufacturer1 (specify) \$ \_\_\_\_\_

☐ Manufacturer2 (specify) \$ \_\_\_\_\_

☐ Natural Resources Canada \$ \_\_\_\_\_

☐ Other Federal Government \$ \_\_\_\_\_

☐ Provincial Government \$ \_\_\_\_\_

☐ City/Town/Municipality \$ \_\_\_\_\_

☐ Other \$ \_\_\_\_\_

☐ Don't know

☐ Refused

R6. How influential was the Retail Markdown program on each of the following aspects of your stores? Please answer using a scale where 0 means "Not at all influent" and where 10 means "Very influent".

a. Your stores offer of ENERGY STAR refrigerators

Scale:

b. The knowledge of your salespersons with regard to Energy Star refrigerators

Scale:

c. The knowledge of consumers with regard to Energy Star refrigerators

Scale:

d. The variety of Energy Star refrigerators offered in your stores

Scale:

- R7. What percentage of your sales of ENERGY STAR refrigerators outside of the two markdown periods do you attribute to the program (or think occurred because of the program)? [SINCE THE MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION] [IF THE RESPONDENT HAS DIFFICULTY PROVIDING AN EXACT PERCENTAGE, ASK FOR A RANGE]

Enter %:

**ASK IF ENERGY STAR CLOTHES WASHERS WERE REBATED THROUGH THE PROGRAM –  
ASK DEPENDING ON WHICH MARKDOWN PERIOD(S) THE RETAILER PARTICIPATED IN**

**ENERGY STAR Clothes Washers**

- W1. I now have a few questions about your sales of ENERGY STAR clothes washers.

We would like to know your approximate sales volume for ENERGY STAR clothes washers for both 2011 Markdown periods and for 2011 altogether.

- A. According to our information, you sold \_\_\_\_\_ ENERGY STAR clothes washers DURING the Markdown promotion in May and June? Is this accurate?
- B. Do you think that your sales of ENERGY STAR clothes washers from the Markdown period currently in effect will be the same as your sales from the May-June Markdown period? If not, will they be higher or lower? Can you give me an estimate? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]
- C. Roughly, how many ENERGY STAR clothes washers do you think you will sell in 2011 outside of the two Markdown periods or what percentage of your 2011 sales approximately will occur during the two Markdown periods?

- W2. During the May-June promotion, the Markdown program provided a discount of \$100 for each ENERGY STAR clothes washer sold in your stores. If this discount had not been available, do you think that your May-June sales of ENERGY STAR clothes washers would have been about the same, lower or higher?

- ☐ Same [SKIP TO W3]
- ☐ Lower
- ☐ Higher [SKIP TO W3]
- ☐ Don't know [SKIP TO W3]
- ☐ Refused [SKIP TO W3]



W2a. By what percentage do you estimate your stores' sales of ENERGY STAR clothes washers would have been lower during the May-June promotion period if the discount had not been available?

RECORD PERCENTAGE \_\_\_\_%

W2b. By answering that your sales would have been the same without the discount, do you mean that the program had no influence on your sales of ENERGY STAR clothes washers?

☐ Yes, the program had no influence on my sales [GO TO W3]

☐ No, the program did have an influence on my sales [GO BACK TO W2a]

☐ Don't know [GO TO W3]

☐ Refused [GO TO W3]

W3. Do you think that your October-November sales of ENERGY STAR clothes washers will be about the same, lower or higher than they would have been without the discount offered?

☐ Same [SKIP TO W4]

☐ Lower

☐ Higher [SKIP TO W4]

☐ Don't know [SKIP TO W4]

☐ Refused [SKIP TO W4]

W3a. By what percentage do you estimate your stores' sales of ENERGY STAR clothes washers would be lower during the October-November promotion period if the discount was not available? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION]

RECORD PERCENTAGE \_\_\_\_%

IF DIFFERENT FROM W2a, ASK WHY

W4. During the May-June promotion period, besides the Markdown program discounts, were there any other discounts provided on ENERGY STAR clothes washers?

- ☐ Yes [GO TO W4a]  
☐ No [GO TO W5]  
☐ Don't know [GO TO W5]  
☐ Refused [GO TO W5]

W4a. Who offered the discount(s) and what was the value of the discount(s)?

- ☐ Store \$ \_\_\_\_\_  
☐ Manufacturer1 (specify) \$ \_\_\_\_\_  
☐ Manufacturer2 (specify) \$ \_\_\_\_\_  
☐ Natural Resources Canada \$ \_\_\_\_\_  
☐ Other Federal Government \$ \_\_\_\_\_  
☐ Provincial Government \$ \_\_\_\_\_  
☐ City/Town/Municipality \$ \_\_\_\_\_  
☐ Other \$ \_\_\_\_\_  
☐ Don't know  
☐ Refused

W5. During the October-November promotion period currently in effect, besides the Markdown program discounts, are there any other discounts provided on ENERGY STAR clothes washers?

- ☐ Yes [GO TO W5a]  
☐ No [GO TO W6]  
☐ Don't know [GO TO W6]  
☐ Refused [GO TO W6]

W5a. Who offers the discount(s) and what is the value of the discount(s)?

- ☐ Store \$ \_\_\_\_\_
- ☐ Manufacturer1 (specify) \$ \_\_\_\_\_
- ☐ Manufacturer2 (specify) \$ \_\_\_\_\_
- ☐ Natural Resources Canada \$ \_\_\_\_\_
- ☐ Other Federal Government \$ \_\_\_\_\_
- ☐ Provincial Government \$ \_\_\_\_\_
- ☐ City/Town/Municipality \$ \_\_\_\_\_
- ☐ Other \$ \_\_\_\_\_
- ☐ Don't know
- ☐ Refused

W6. How influential was the Retail Markdown program on each of the following aspects of your stores? Please answer using a scale where 0 means "Not at all influent" and where 10 means "Very influent".

a. Your stores offer of ENERGY STAR clothes washers

Scale:

b. The knowledge of your salespersons with regard to Energy Star clothes washers

Scale:

c. The knowledge of consumers with regard to Energy Star clothes washers

Scale:

d. The variety of Energy Star clothes washers offered in your stores

Scale:

- W7. What percentage of your sales of ENERGY STAR clothes washers outside of the two markdown periods do you attribute to the program (or think occurred because of the program)? [SINCE THE SECOND MARKDOWN PERIOD IS NOT OVER YET, ASK THE RESPONDENT TO ANSWER BASED ON A PROJECTION] [IF THE RESPONDENT HAS DIFFICULTY PROVIDING AN EXACT PERCENTAGE, ASK FOR A RANGE]

Enter %:

### **SATISFACTION WITH PROGRAM**

- S1 On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your overall satisfaction with the program?

Scale:

- S1a If your answer to S1 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

- S2. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to the preparation process to the Markdown promotion periods?

Scale:

- S2a If your answer to S2 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

- S3. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to program marketing and advertising?

Scale:

- S3a If your answer to S3 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S4. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to program support and communications?

Scale:

S4a If your answer to S4 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S5. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to the items covered by the program?

Scale:

S5a If your answer to S5 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S6. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to the program discounts?

Scale:

S6a If your answer to S6 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S7. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your interaction with Summerhill?

Scale:

S7a If your answer to S7 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S8. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your interaction with the implementation contractor?

Scale:

S8a If your answer to S8 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S9. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to discount processing?

Scale:

S9a If your answer to S9 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

S10. On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), what is your satisfaction level in regard to the tracking and reporting of discounts?

Scale:

S10a If your answer to S10 was equal to or less than 8, would you care to share the reason or reasons for such a score?

Reason(s):

## **BARRIERS AND RECOMMENDATIONS**

BR1 In your opinion, what are the main barriers to the implementation of the program by order of importance?

BR2     What is your opinion regarding the duration of the program (two-month period twice a year vs. year-round)?

BR3     Do you think that marked down products should be promoted at a particular time of the year where sales are at their highest?

☐ Yes

☐ No

☐ No opinion

BR4     Did you receive any complaints from participants in the program?

☐ Yes

BR4a.   What was (were) the complaint(s) about?

☐ No

☐ Don't Know

☐ Refused

☐ Not applicable

BR5     Do you have any suggestion to improve the program?

☐ No

☐ Yes

BR5a    If "Yes," please explain the nature of the improvement(s):

**END:** Those are all the questions I have for you today. Do you have anything to add regarding the program or this interview?

I thank you very much for your collaboration and the time you took to answer our questions.

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## **APPENDIX VI - PARTICIPANT AND NON-PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant and Non-participant Survey**

#### **ENSC - Retail Markdown Program**

December 9, 2011

### **INTRODUCTION**

Hello, my name is \_\_\_\_\_ and I am with Corporate Research Associates, and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. We are trying to get feedback from customers about energy-efficient lighting products and your perceptions about these products.

I1. May I speak with a head of the household, 18 years of age or older?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." ASK I2]

I2. Are you 18 years of age or older?

1. Yes [GO TO I3]
2. No [THANKS AND TERMINATE]

### **INTRODUCTION**

[READ IF THIS PERSON HASN'T HEARD IT YET.] Hello, my name is \_\_\_\_\_ and I am with Corporate Research Associates, and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. We are trying to get feedback from customers about energy-efficient lighting products and your perceptions about these products.



I3. The survey will take about ten minutes. Is this a good time for you?

[IF REFUSE, ASK “Can we schedule a more convenient time for you to conduct this survey?”

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

D10. **[DO NOT READ]** Gender

1. Male
2. Female

D7. To begin, what is your age group? Are you... READ IN ORDER.

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused) THANK, TERMINATE, AND RECORD

### **ES. AWARENESS OF ENERGY STAR™**

ES1. How familiar are you with the ENERGY STAR™ label or symbol? Would you say that you are...

1. Very familiar
2. Somewhat familiar
3. Slightly familiar
4. Not at all familiar
98. (Don't know)
99. (Refused)

**AB. AWARENESS OF CFLS**

AB1. Some of my questions will be about energy-saving lighting, such as compact fluorescent [Pronounced “flor-ess-ent”] bulbs, also known as CFLs. CFLs or compact fluorescent light bulbs use much less energy than regular incandescent bulbs. They can be used to replace your regular 60, 75, or 100 Watt light bulbs, but use about 75% less energy. How familiar are you with **energy saving compact fluorescent bulbs**? Would you say that you are...

1. Very familiar
2. Somewhat familiar
3. Slightly familiar
4. Not at all familiar before being read this description
98. (Don't know)
99. (Refused)

AB2. To the best of your knowledge, do some CFL bulbs ...: [RANDOMIZE ORDER OF STATEMENTS – CODE ONE ONLY PER STATEMENT]

- a. Have glass tubes bent into a spiral?
- b. Have glass tubes bent into a U-shape or rectangular shape?
- c. Look pretty much like regular light bulbs, but have a heavier base?
  1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

**AP. ANNUAL PURCHASE**

AP1. **In 2011 so far**, approximately how many total compact fluorescent light bulbs in total has your household purchased? If a package contained multiple CFLs, please count each CFL bulb separately and if you purchased multiple packages, please count the total number of individual CFL bulbs across all of the packages. **[RECORD # OF BULBS, NOT RANGE. IF ‘DON’T KNOW, PROBE: ‘IF YOU HAD TO GUESS, DO YOU THINK THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED SO FAR IN 2011 WAS:’ AND SHOW CATEGORIES IN 5-BULB INCREMENTS (E.G., 0, 1-5, 6-10, ETC.). 98=DON’T KNOW, 99=REFUSED]**

**If respondent has difficulty doing the math in their head, ask them if they would prefer to tell you the number of each pack size they purchased in 2011 so far and that we would calculate the total number of CFLs. if yes, go to AP2 series.**

AP2T. Record Number of CFL Bulbs— January – day of interview 2011

Purchases by pack size January-Day of interview 2011:

- AP2a. Number of single CFL bulb packs \_\_\_\_\_
- AP2b. Number of two-pack CFLs \_\_\_\_\_
- AP2c. Number of three-pack CFLs \_\_\_\_\_
- AP2d. Number of four-pack CFLs \_\_\_\_\_
- AP2e. Number of five-pack CFLs \_\_\_\_\_
- AP2f. Number of six-pack CFLs \_\_\_\_\_
- AP2g. Number of seven-pack CFLs \_\_\_\_\_
- AP2h. Number of eight-pack CFLs \_\_\_\_\_
- AP2i. Number of nine-pack CFLs \_\_\_\_\_
- AP2j. Number of ten-pack CFLs \_\_\_\_\_
- AP2k. Number of eleven-pack CFLs \_\_\_\_\_
- AP2l. Number of twelve-pack CFLs \_\_\_\_\_
98. (Don't know)
99. (Refused)

AP2T = \_\_\_\_\_

**PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN AP2a-AP2l AND INSERT THAT VALUE IN AP2T.**

**[SKIP TO NP SECTION IF AB1=4, DK, Ref AND AB2A=2, DK, Ref AND AB2B=2, DK, Ref AND AB2C=2, DK, Ref (Not familiar with any type of CFL at all) AND AP1=0, DK, Ref (No purchase in 2011)]**

**MP. MARKDOWN PERIOD [MP SERIES]**

MP1. [ASK IF AP1>0 OR AP2T>0] **From October 1<sup>st</sup>, 2011 to today**, approximately how many compact fluorescent light bulbs did your household purchase? Here again, if a package contained multiple CFLs, please count each CFL bulb separately and if you purchased multiple packages, please count the total number of individual CFL bulbs across all of the packages. **[RECORD # OF BULBS, NOT RANGE. IF ‘DON’T KNOW, PROBE: ‘IF YOU HAD TO GUESS, DO YOU THINK THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM OCTOBER 1<sup>ST</sup> TO DAY WAS:’ AND SHOW CATEGORIES IN 5-BULB INCREMENTS (E.G., 0, 1-5, 6-10, ETC.). 98=DON’T KNOW, 99=REFUSED]** [MP1 SHOULD NOT EXCEED AP1 OR AP2T ; IN THAT CASE VALIDATE ANSWERS TO AP1 OR AP2T]

**If respondent has difficulty doing the math in their head, ask them if they would prefer to tell you the number of each pack size they purchased in October or November and that we would calculate the total number of CFLs. if yes, go to MP2 series.**

**MP2T. Record Number of CFL Bulbs— October 1<sup>st</sup> – day of interview 2011**

Purchases by pack size October 1<sup>st</sup> -Day of interview 2011:

- MP2a. Number of single CFL bulb packs \_\_\_\_\_
- MP2b. Number of two-pack CFLs \_\_\_\_\_
- MP2c. Number of three-pack CFLs \_\_\_\_\_
- MP2d. Number of four-pack CFLs \_\_\_\_\_
- MP2e. Number of five-pack CFLs \_\_\_\_\_
- MP2f. Number of six-pack CFLs \_\_\_\_\_
- MP2g. Number of seven-pack CFLs \_\_\_\_\_
- MP2h. Number of eight-pack CFLs \_\_\_\_\_
- MP2i. Number of nine-pack CFLs \_\_\_\_\_
- MP2j. Number of ten-pack CFLs \_\_\_\_\_
- MP2k. Number of eleven-pack CFLs \_\_\_\_\_
- MP2l. Number of twelve-pack CFLs \_\_\_\_\_

- 98. (Don’t know)
- 99. (Refused)

MP2T = \_\_\_\_\_

**PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN MP2a-MP2I AND INSERT THAT VALUE IN MP2T.**

ES2. [ASK IF **MP1**>0 or **MP2T**>0]: We know that some CFLs have the ENERGY STAR label and some do not. Can you please tell me of the [**Value from MP1 or MP2T**] CFL bulbs that you purchased in October and November, how many were ENERGY STAR™- CFL bulbs? [**RECORD # OF BULBS, NOT RANGE. IF ‘DON’T KNOW, PROBE: ‘Is it less than or more than 5 bulbs?’ AND WORK FROM THERE TO GET ESTIMATE. 98=DON’T KNOW, 99=REFUSED**] [**ES2 SHOULD NOT EXCEED MP1 OR MP2T ; IN THAT CASE VALIDATE ANSWERS TO MP1 OR MP2T**]

PS2. [**ES2**>0] What were the names of the stores from which you purchased **ENERGY STAR™**- CFL bulbs from in October and November? [**RANDOMIZE AND READ. RESPONSES FOR A-J: 1=Yes, 2=No, 98=DON’T KNOW, 99=REFUSED**]

- A. Canadian Tire
  - B. Costco
  - C. Home Hardware
  - D. Kent
  - E. Rona
  - F. Loblaw's/Atlantic Superstore
  - G. Home Depot
  - H. Tim-Br Mart
  - I. Central
- 
- 1. Yes, purchased from that store
  - 2. No, did not purchase from that store
  - 98. (Don't know)
  - 99. (Refused)

MP4. [ASK IF AP1>0 OR AP2T>0] Now, I'd like you to think about the purchase of CFLs that your household could have made in May or June 2011. Between May 1<sup>st</sup> to June 30<sup>th</sup>, approximately how many compact fluorescent light bulbs did your household purchase? Here again, if a package contained multiple CFLs, please count each CFL bulb separately and if you purchased multiple packages, please count the total number of individual CFL bulbs across all of the packages. **[RECORD # OF BULBS, NOT RANGE. IF 'DON'T KNOW, PROBE: 'IF YOU HAD TO GUESS, DO YOU THINK THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED IN MAY OR JUNE 2011 WAS:' AND SHOW CATEGORIES IN 5-BULB INCREMENTS (E.G., 0, 1-5, 6-10, ETC.). 98=DON'T KNOW, 99=REFUSED]** [MP4+MP1 SHOULD NOT EXCEED AP1 OR AP2T ; IN THAT CASE VALIDATE ANSWERS TO PREVIOUS ANSWERS]

If respondent has difficulty doing the math in their head, ask them if they would prefer to tell you the number of each pack size they purchased in May or June and that we would calculate the total number of CFLs. if yes, go to MP5 series.

**MP5T. Record NUMBER OF CFL BULBS— MAY 1<sup>ST</sup> – JUNE 30<sup>TH</sup> 2011**

Purchases by pack size May 1<sup>st</sup> – June 30<sup>th</sup> 2011:

- MP5a. Number of single CFL bulb packs \_\_\_\_\_
- MP5b. Number of two-pack CFLs \_\_\_\_\_
- MP5c. Number of three-pack CFLs \_\_\_\_\_
- MP5d. Number of four-pack CFLs \_\_\_\_\_
- MP5e. Number of five-pack CFLs \_\_\_\_\_
- MP5f. Number of six-pack CFLs \_\_\_\_\_
- MP5g. Number of seven-pack CFLs \_\_\_\_\_
- MP5h. Number of eight-pack CFLs \_\_\_\_\_
- MP5i. Number of nine-pack CFLs \_\_\_\_\_
- MP5j. Number of ten-pack CFLs \_\_\_\_\_
- MP5k. Number of eleven-pack CFLs \_\_\_\_\_
- MP5l. Number of twelve-pack CFLs \_\_\_\_\_

- 98. (Don't know)
- 99. (Refused)

MP5T = \_\_\_\_\_

**PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN MP5a-MP5I AND INSERT THAT VALUE IN MP5T.**

ES3. [ASK IF MP4>0 or MP5T>0]: We know that some CFLs have the ENERGY STAR label and some do not. Can you please tell me of the [Value from MP4 or MP5T] CFL bulbs that you purchased in May and June, how many were ENERGY STAR™ CFL bulbs? **[RECORD # OF BULBS, NOT RANGE. IF 'DON'T KNOW, PROBE: 'Is it less than or more than 5 bulbs?' AND WORK FROM THERE TO GET ESTIMATE. 98=DON'T KNOW, 99=REFUSED]** [ES3 SHOULD NOT EXCEED MP4 OR MP5T ; IN THAT CASE VALIDATE ANSWERS TO MP4 OR MP5T]

PS3. [ES3>0] What were the names of the stores that you purchased **ENERGY STAR™**- CFL bulbs from in May and June? **[RANDOMIZE AND READ. RESPONSES FOR A-J: 1=Yes, 2=No, 98=DON'T KNOW, 99=REFUSED]**

- A. Canadian Tire
  - B. Costco
  - C. Home Hardware
  - D. Kent
  - E. Rona
  - F. Loblaw's/Atlantic Superstore
  - G. Home Depot
  - H. Tim-Br Mart
  - I. Central
  - J. Wal-Mart (May-June only)
- 
- 1. Yes, purchased from that store
  - 2. No, did not purchase from that store
  - 98. (Don't know)
  - 99. (Refused)

|                        |                                                                                                           |                                                                                                                                                                                                                     |                 |
|------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>PARTICIPANT</b>     | Bought ES CFLs during one of the Markdown Period at one of the selected stores (PS2 or PS3)               | <u>[PS2A-i = at least one yes] (OR)</u><br><u>[PS3A-J = at least one yes]</u>                                                                                                                                       | <b>QUOTA=70</b> |
| <b>NON PARTICIPANT</b> | Did not buy CFLs in 2011 or did not buy ES CFLs during the Markdown Periods at one of the selected stores | AP1=0, DK, Ref<br>OR<br><u>[MP1=0, DK, Ref or MP2T=0, DK, Ref or ES2=0, DK, Ref or PS2A-i ≠ at least one yes] (OR)</u><br><u>[MP4=0, DK, Ref or MP5T=0, DK, Ref or ES3=0, DK, Ref or PS3A-J ≠ at least one yes]</u> | <b>QUOTA=70</b> |

## **P. PARTICIPANTS [P SERIES]**

[ASK PARTICIPANT ONLY]

**PROGRAMMING NOTE: IN THE SUBSEQUENT SECTIONS, INSERT MARKDOWN PERIOD IN BRACKET [October or November / May or June] BASED ON ANSWERS AT ES2 AND ES3. PARTICIPANTS ARE ASKED ABOUT THE MOST RECENT MARKDOWN PERIOD FOR WHICH THEY PURCHASED CFLS (IF MORE THAN ONE PERIOD).**

**IF (MP3T>0) AND (ES3>0): [since October 1st]**

**IF (MP3T>0) AND (ES3=0,DK,REF): [since October 1st]**

**IF (ES2=0,DK,REF) AND (ES3>0): [May or June]**

**IF (ES2=0,DK,REF) AND (ES3=0,DK,REF): GO TO NP SERIES**

[READ IF BOTH MARKDOWN PERIODS (ES2>0) AND (ES3>0)] For the next questions, please think only about the CFLs that your household purchased since October 1st of this year.



- P1. Thinking of the compact fluorescent light bulbs that you purchased in [Markdown Period] of this year, why did you purchase these CFLs? Probe: Anything else? [MULTIPLE RESPONSE; DO NOT READ]
1. (Low price)
  2. (Discount/coupon)
  3. (Utility/Efficiency Nova Scotia recommended)
  4. Advertising/Marketing Material
  5. (Wanted to try)
  6. (Wanted long-life bulb)
  7. (To save energy/electricity)
  8. (To save money on electric bills)
  9. (Good for environment)
  10. (Other - specify\_\_\_\_\_)
  98. (Don't Know)
  99. (Refused)
- P2. In [Markdown Period], do you recall seeing any in-store promotions from Efficiency Nova Scotia regarding the purchase and use of compact fluorescent light bulbs? This may have included such things as representatives providing information, and signs, or posters.
1. Yes
  2. No
  98. (Don't Know)
  99. (Refused)

**FR. FREE-RIDERSHIP**

[ASK PARTICIPANT ONLY]

- P3. You bought CFLs in [Markdown Period]. During that period, Efficiency Nova Scotia offered a discount of \$3 or \$5 on packages of ENERGY STAR CFLs. **Before paying at the register**, were you aware that a discount was offered on the purchase of specific packages of compact fluorescent light bulbs?
1. Yes
  2. No
  98. (Don't Know)
  99. (Refused)

**[ASK IF AWARE OF THE DISCOUNT (P3=1)]**

FR1. Did you have any plans to purchase CFLs before learning about the discount on CFLs?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[ASK IF NOT AWARE OF THE DISCOUNT (P3=2,DK,REF) OR IF FR1=01 "Yes"]**

FR2. I just want to make sure I understand - You had already decided to purchase CFLs prior to you learning about the discount on CFLs?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

FR3. Thinking of the CFLs that you purchased with the discount of \$3 or \$5 offered by Efficiency Nova Scotia, if the discount had NOT been offered, how likely would you have been to buy the CFLs? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely **Would Not** Have Bought the CFLs" and a 10 indicating that you "Definitely **Would Have Bought the CFLs.**"

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR4a. And if you had purchased the CFLs **without** the discount, would you have purchased definitely the same number of CFLs, probably the same number, probably less or definitely less?

- 1. Definitely the same number
- 2. Probably the same number
- 3. Probably less
- 4. Definitely less
- 99. (Don't know/Refused)

**[ASK IF FR4a=3 OR 4 (PROBABLY OR DEFINITELY LESS)]**

FR4b. How many fewer CFLs would you have purchased **without** the discount? Just as a reminder, you mentioned that you purchased [# ES2 or ES3] CFLs for which you received a discount.

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR5. If the discount had NOT been offered, what is the likelihood that you would have purchased the same number of CFLs that you purchased in [Markdown Period] *but at a later date*? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely would have still made the Purchase **when you did**,” and a 10 indicating that you “Definitely would have made the purchase **at a later date**.”

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

**IF FR5 > 5, then ask:**

**[DO NOT ASK IF FR5=98 OR 99]**

FR6. You indicated in your previous response that if the discount had NOT been offered there was an [FR5] in 10 likelihood that you would have purchased the CFLs *but at a later date*. Approximately how many months later would you have purchased these products? **DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE**

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't know)
99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN ANSWER IN MONTHS, READ:**

Would it have been within . . .

1. Less than 3 months?
2. 3 months to less than 6 months later
3. 6 months to less than 9 months years later?
4. 9 months to less than 12 months later?
5. 12 months later or more?
6. (Never)
98. (Don't Know)
99. (Refused)

FR7. How influential was the discount offered by Efficiency Nova Scotia on your decision to purchase these [# ES2 or ES3] CFLs in [Markdown Period] of this year? Please give your answer on a scale of 0 to 10, where 0 indicates the discount 'had no influence at all on your purchase decision' and 10 indicates that the discount was 'extremely influential to your purchase decision.

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

### **IC. CFL IN-SERVICE RATE**

[ASK PARTICIPANT ONLY]

IC1. Earlier you said that you purchased a total of [ES2 or ES34] CFLs for which you received a discount in [Markdown Period] of this year. How many of these [ES2 or ES3] bulbs are **currently installed** in lamps or fixtures at your home? [RECORD ONE NUMBER, NOT A RANGE. IF RESPONDENT GIVES A RANGE, RECORD MIDDLE VALUE. IF 'DON'T KNOW,' PROBE FOR BEST GUESS TO NARROW IN ON A NUMBER.]

[RECORD NUMBER] \_\_\_\_\_ [CHECK TO MAKE SURE IC1 <= ES2 or ES3]

IC2. NUMBER OF CFLs NOT INSTALLED [IC2 IS NOT A QUESTION, BUT ONLY A CATEGORICAL VARIABLE]

**PROGRAMMING NOTE: CALCULATE NUMBER OF CFLS NOT INSTALLED BASED ON ANSWER TO ES2 OR ES3 (# PURCHASED) AND IC1 (# INSTALLED) [TOTAL # ES2 OR ES3 MINUS IC1]. INSERT THAT VALUE IN IC2. RECORD 99 IF IT IS NOT POSSIBLE TO CALCULATE BECAUSE OF DK OR REFUSAL AT PREVIOUS QUESTIONS.**

### **CFLs not installed**

[ASK IF IC2>0]

IC3. Of the [# IC2] CFL(s) not currently installed in your home, how many are not installed because... POSE STATEMENTS IN ORDER [RECORD NUMBER, DO NOT ACCEPT A RANGE, 98=DK, 99=REF]

- a. they are in storage until a bulb needs to be replaced
- b. they broke or burned out **[SKIP IF IC3a=IC2]**
- c. they were installed but you removed them **[SKIP IF IC3a+b=IC2]**

- d. they are installed in another residence [**SKIP IF IC3a+b+c=IC2**]
- e. they are installed in a business [**SKIP IF IC3a+b+c+d=IC2**]
- f. you gave them away [**SKIP IF IC3a+b+c+d+e=IC2**]
- g. of other reasons (GO TO IC4) [**SKIP IF SUM OF IC3a THROUGH IC3f=IC2**]

[ASK IF IC3g >0]

IC4. What are the other reasons why [# IC3g] of the [# IC2] CFLs are not currently installed in your home? [OPEN END, 98=DK, 99=REFUSED]

[ASK IF IC3c>0]

IC5. Why did you remove [# IC3c] CFLs? [MULTIPLE RESPONSE – DON'T READ LIST]

**Light Quality**

- 1. (Bulb is too bright)
- 2. (Bulb is not bright enough)
- 3. (Don't like the overall quality of the light)
- 4. (Don't like the color of the light—it is too [SPECIFY: \_\_\_\_\_])

**Function/Performance**

- 5. (Delay in light coming on)
- 6. (Interference with radio, TV, other electronic devices)
- 7. (Light beginning to dim)
- 8. (Doesn't work with dimmer switch/3-way switch)
- 9. (It flickers)
- 10. (Doesn't save energy)

**Physical Limitations**

- 11. (Burned out)
- 12. (Broke)
- 13. (Doesn't fit properly)
- 14. (Don't like appearance in fixture/bulb is ugly)
- 15. (Bulb is too heavy)
- 16. (Bulb contains mercury)
- 96. (Other [Specify \_\_\_\_\_])

98. (Don't know)

99. (Refused)

**Installed CFLs**

[ASK IF IC1&gt;0 (CFLs installed)]

IC6. Of the [# IC1] CFLs that you purchased and that are currently installed in your household, how many... **POSE STATEMENTS IN ORDER [98=DK, 99=REFUSED]**

- A. replaced incandescent bulbs [IF RESPONDENT ASKS 'WHAT IS AN INCANDESCENT BULB?', SAY 'An incandescent bulb is the type of bulb that most homes currently use—that is, a traditional light bulb.'] [ENTER NUMBER OF BULBS \_\_\_\_] [VALIDATE IF ANSWERS EXCEED IC1]
- B. [SKIP IF IC6A=IC1] replaced another compact fluorescent bulb [ENTER NUMBER OF BULBS \_\_\_\_]
- C. [SKIP IF IC6A+IC6B=IC1] were put in new fixtures or fixtures that didn't have bulbs before [ENTER NUMBER OF BULBS \_\_\_\_]

IC7. When you purchase CFLs to replace regular incandescent light bulbs, on what do you usually rely to select the right wattage for your CFLs? [DO NOT READ, ONE RESPONSE]

- 1. (I use the guideline about equivalent wattage/power that appears on the package)
- 2. (I ask a salesperson)
- 3. (I use the guideline on equivalent wattage from the Energy Star website)
- 4. (I use the general 4-to-1 conversion rule where I divide the wattage of the bulb to be replaced by 4 to select the right CFL)
- 5. (I use the same wattage as with the bulbs to be replaced)
- 6. (I use a higher wattage than with the bulbs to be replaced)
- 7. (It depends on the quantity of light that I need - lumens)
- 96. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

IC8. Overall, how satisfied are you with the discounted CFLs you bought in [Markdown Period] of this year? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

1. Very satisfied
2. Satisfied
3. Neither satisfied or dissatisfied
4. Dissatisfied
5. Very Dissatisfied
98. (Don't know)
99. (Refused)

IC9. [IF IC8 = 4 OR 5] Why are you not satisfied with the CFL bulbs? [MULTIPLE MENTION, DON'T READ LIST]

**Light Quality**

1. (Bulb is too bright)
2. (Bulb is not bright enough)
3. (Don't like the overall quality of the light)
4. (Don't like the color of the light—it is too [SPECIFY: \_\_\_\_\_])

**Function/Performance**

5. (Delay in light coming on)
6. (Interference with radio, TV, other electronic devices)
7. (Light beginning to dim)
8. (Doesn't work with dimmer switch/3-way switch)
9. (It flickers)
10. Doesn't save energy)

**Physical Limitations**

11. (Burned out)
12. (Broke)
13. (Doesn't fit properly)
14. (Don't like appearance in fixture/bulb is ugly)
15. (Bulb is too heavy)
16. (Bulb contains mercury)
96. (Other [Specify \_\_\_\_\_])
98. (Don't know)
99. (Refused)

**NP. NON-PARTICIPANTS**

[ASK ONLY NON-PARTICIPANTS]

NP1a. [IF AP1=0,DK,REF (haven't purchased CFLs in past year)] Have you ever purchased a compact fluorescent bulb?

1. Yes
2. No
98. (Don't Know)
99. (Refused)

NP1b. [IF NP1a=2 or 98, OR 99,READ:] Why have you never purchased a compact fluorescent light bulb?

[IF NP1a=1, READ:] Why have you not purchased any compact fluorescent light bulbs in the past year?

[IF AP1>0 AND MP1=0 AND MP4=0, READ:] Why did you not purchase any compact fluorescent light bulbs in May, June, October or November, 2011?

1. (Too expensive)
2. (Not available in my area/store that carries them is too far)
3. (Too busy or not enough time)
4. (Waiting for old bulbs to burn out)
5. (They don't last long/break)
6. (Too bright)
7. (Not bright enough)
8. (Delay in light coming on)
9. (Doesn't work with dimmer or 3-way switch)
10. (Doesn't fit properly)
11. (Sticks out of fixture)
12. (Don't like light color)
13. (Interference with radio, TV, other electronic devices)
14. (Bulb contains mercury)
15. (Don't need them)
96. (Other **[SPECIFY]** \_\_\_\_\_)
98. (Don't know)
99. (Refused)

NP1c. DELETED



NP2a. Do you recall seeing any promotions from Efficiency Nova Scotia regarding the purchase and use of compact fluorescent light bulbs in a number of retail stores in the province? This may have included such things as representatives providing information, and signs, or posters.

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

NP2b. Were you aware that Efficiency Nova Scotia was offering a discount on the purchase of specific packages of compact fluorescent light bulbs at many retail stores in the province?

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

NP3a. Are there any compact fluorescent bulbs currently installed in your home?

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

NP3b. [IF NP3a=1] Approximately, how many compact fluorescent bulbs are currently installed in your home?

ENTER NUMBER \_\_\_\_\_ [98=DK, 99=REF]

NP4. [IF NP3a=1] Overall, how satisfied are you with the compact fluorescent light bulbs installed in your home? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

- 1. Very satisfied
- 2. Satisfied
- 3. Neither satisfied or dissatisfied
- 4. Dissatisfied
- 5. Very Dissatisfied
- 98. (Don't know)
- 99. (Refused)

NP5. [IF NP4 = 4 OR 5] Why are you not satisfied with the CFL bulbs? Probe: Anything else?  
[MULTIPLE MENTION, DON'T READ LIST]

**Light Quality**

1. (Bulb is too bright)
2. (Bulb is not bright enough)
3. (Don't like the overall quality of the light)
4. (Don't like the color of the light—it is too [SPECIFY: \_\_\_\_\_])

**Function/Performance**

5. (Delay in light coming on)
6. (Interference with radio, TV, other electronic devices)
7. (Light beginning to dim)
8. (Doesn't work with dimmer switch/3-way switch)
9. (It flickers)
10. (Doesn't save energy)

**Physical Limitations**

11. (Burned out)
12. (Broke)
13. (Doesn't fit properly)
14. (Don't like appearance in fixture/bulb is ugly)
15. (Bulb is too heavy)
16. (Bulb contains mercury)
96. (Other [Specify \_\_\_\_\_])
98. (Don't know)
99. (Refused)

**FP. FUTURE PURCHASES**

[ASK ALL RESPONDENTS]

FP1. How likely are you or someone in your household to buy compact fluorescent bulbs in the next year? Use a scale from 0 to 10, where 0 is “extremely unlikely” and 10 is “extremely likely.” [99=DON'T KNOW]

FP2. [IF #FP1 <= 8] What would encourage you to buy CFL bulbs in the next year? [DO NOT READ RESPONSES; MULTIPLE RESPONSE]

1. (Lower price/make them less expensive)
2. (Make them available at a store near me)
3. (Make them brighter)
4. (If they worked with dimmer or 3-way fixture)
5. (If they fit in fixture better)
6. (If they had better color)
7. (If they didn't interfere with radio/TV/other electronic devices)
8. (Make some that last longer/don't break)
9. (Nothing)
96. (Other [SPECIFY: \_\_\_\_\_])
98. (Don' know)
99. (Refused)

**D. DEMOGRAPHICS**

[ASK ALL RESPONDENTS]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-7; SELECT ONE RESPONSE]

1. Detached single-family house
2. Semi-detached house
3. Mobile home or house trailer
4. Townhouse or duplex which share adjacent walls
5. Row house (Single story apartment building)
6. Apartment or condo building that has fewer than five stories

- 7. Apartment or condo building that has five or more
- 96. Other [SPECIFY: \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

D2. How many bedrooms are in your residence? \_\_\_\_ [98=DK, 99=REF; Enter zero for a studio apartment with no bedrooms]

D3. Do you own or rent this residence?

- 1. Own/buying
- 2. Rent/lease
- 96. Other (Describe) \_\_\_\_\_

D4. Do you pay the electric bills for your residence?

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

- 1. (Less than high school graduation certificate)
- 2. (High school graduation certificate and/or some post-secondary)
- 3. (Trades certificate or diploma)
- 4. (College certificate or diploma)
- 5. (University certificate or diploma)
- 98. (Don't know)
- 99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
8. \$80,000 or more
98. (Don't know)
99. (Refused)

END. Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## **APPENDIX VII - ON-SITE VISIT PROTOCOL**

### **1 PROGRAM OVERVIEW**

The 2011 Efficiency Nova Scotia Retail Markdown Program (RMP) ran from May 1 to June 30, 2011 and will run from October 1 to November 30, 2011. The program is known as “Plug Into Savings” and features the following discounts on energy-efficient items:

- > Save \$3 on ENERGY STAR Regular CFLs (multipacks of 4 or more);
- > Save \$3 on ENERGY STAR Specialty CFLs (single or double packs);
- > Save \$5 on ENERGY STAR Specialty CFLs (multipacks of 3 or more);
- > Save \$10-\$30 on Programmable Thermostats for Baseboard Heaters;
- > Save \$4 on Power Bars with Integrated Timer;
- > Save \$3 on Indoor or Outdoor Motion Sensors (hard-wired);
- > Save \$3 on Dimmer Switches (hard-wired);
- > Save \$10 on Heavy Duty Outdoor Timers (plug-in);
- > Save \$100 on Select Energy Star Refrigerators;
- > Save \$100 on Select Energy Star Clothes Washers.

Participating stores include 12 major chain retailers across Nova Scotia. In addition to these locations, 36 independent retailers are part of the program.

### **2 INTRODUCTION**

As part of the 2011 evaluation of the RMP, 10 mystery visits and observations are planned at various sales points. These visits and observations are designed to provide the qualitative information required to depict the in-store experience of the client.

These mystery visits and observations will allow assessing the following elements:

- > The efficiency of the instant discounts awarded at the counter;
- > Product promotional displays;
- > Knowledge of products and the program by the employees.

### 3 VISIT DETAILS

The visits will be conducted in October and November 2011.

A total of 10 visits and observations will be completed in various stores in order to ensure that the information collected is representative. Nine major chain retailers and one independent retailer will be visited.

The visits will unfold according to a predetermined scenario. The objective is to acquire the information anonymously.

#### Selected Retailers

| Store                      | Address                                    | Events (when applicable) <sup>25</sup>                                                  |
|----------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------|
| Canadian Tire              | 30 Lamont Terrace, Dartmouth, B3B 0B5      | October 29 <sup>th</sup> & 30 <sup>th</sup> /November 12 <sup>th</sup>                  |
| Canadian Tire              | 16 Dentith Road, Halifax, B3R 2H9          | October 29 <sup>th</sup> & 30 <sup>th</sup>                                             |
| Home Hardware              | 353 Main Street, Kentville, B4N 1K7        |                                                                                         |
| Home Hardware              | 467 Prince Street, Sydney, B1P 5L6         |                                                                                         |
| Home Depot                 | 368 Lacewood Drive, Halifax, B3S 1L8       | October 29 <sup>th</sup> & 30 <sup>th</sup>                                             |
| Kent                       | 225 Chain Lake Drive, Halifax, B3S 1C9     | November 5 <sup>th</sup> /November 12 <sup>th</sup>                                     |
| TIM-BRMART                 | 11 Harris Road, Pictou, B0K 1H0            |                                                                                         |
| Costco                     | 137 Countryview Drive, Dartmouth, B3B 0E7  | October 29 <sup>th</sup> & 30 <sup>th</sup> /Nov. 5 <sup>th</sup> /Nov.12 <sup>th</sup> |
| Rona                       | 350 Horseshoe Lake Drive, Halifax, B3S 0B4 | November 5 <sup>th</sup>                                                                |
| Fast TV Sales and Services | 115 Disco Street, Sydney, B1P 5V8          |                                                                                         |

<sup>25</sup> For four visits in the table above where there is a data under the “Event” column, Equilibrium will have to complete the visit during one of those events according to the dates mentioned (note that those events occur on the weekend). Equilibrium will have to evaluate certain aspects of those events as well, as indicated further in this guide.

## 4 VISIT REPORT

|                       |  |
|-----------------------|--|
| <b>Store Name:</b>    |  |
| <b>Address:</b>       |  |
| <b>Date of Visit:</b> |  |

| Eligible Products                                    |  |
|------------------------------------------------------|--|
| Energy Star Regular CFLs (multipacks of 4 or more)   |  |
| Energy Star Specialty CFLs (single or double packs)  |  |
| Energy Star Specialty CFLs (multipacks of 3 or more) |  |
| Programmable Thermostats for Baseboard Heaters       |  |
| Power Bars with Integrated Timer                     |  |
| Indoor or Outdoor Motion Sensors (hard-wired)        |  |
| Dimmer Switches (hard-wired)                         |  |
| Heavy Duty Outdoor Timers (plug-in)                  |  |
| Energy Star Refrigerators                            |  |
| Energy Star Clothes Washers                          |  |



## 4.1 PRODUCT PURCHASE DETAILS

Table 1: Product Purchase Situation

*In the table below, please check off the items which apply to your product.*

| Product Purchase Situation                                                                     |         |
|------------------------------------------------------------------------------------------------|---------|
| Product to purchase:                                                                           | xxxxxxx |
| Instant discount received directly at the counter upon presentation of the product to purchase |         |
| Instant discount received at the counter only after having provided a coupon                   |         |
| Instant discount received at the counter without any problem                                   |         |
| If applicable, description of the problem met:                                                 |         |

## 4.2 PROMOTIONAL DISPLAY EVALUATION

Table 2: In-Store Promotional Material

*In the table below, please indicate by using Yes/No for each product category whether the promotional material was displayed in store as well as the quantity of each type of promotional material.*

*If needed, please provide additional observations or comments in the Comments section below.*

| Promotional Material | Lighting |    |     | Controls |    |     | Appliances |    |     |
|----------------------|----------|----|-----|----------|----|-----|------------|----|-----|
|                      | Yes      | No | No. | Yes      | No | No. | Yes        | No | No. |
| Shelf Talkers        |          |    |     |          |    |     |            |    |     |
| Posters              |          |    |     |          |    |     |            |    |     |
| Stickers             |          |    |     |          |    |     |            |    |     |
| Street sign          |          |    |     |          |    |     |            |    |     |
| Promotional Material | Lighting |    |     | Controls |    |     | Appliances |    |     |

|                  | Yes | No | No. | Yes | No | No. | Yes | No | No. |
|------------------|-----|----|-----|-----|----|-----|-----|----|-----|
| Vertical Signs   |     |    |     |     |    |     |     |    |     |
| Coupons          |     |    |     |     |    |     |     |    |     |
| Apron Cards      |     |    |     |     |    |     |     |    |     |
| Others (specify) |     |    |     |     |    |     |     |    |     |
| Comments:        |     |    |     |     |    |     |     |    |     |

### Observations

In the store visited, the products eligible for discounts are easily identified. (On a scale from 1 to 5, where 1 means that the products eligible for discounts are hard to identify and 5 that they are easily identified.)

1 ☐

2 ☐

3 ☐

4 ☐

5 ☐

Comments:

Is the overall in-store exposure of the promotional material optimal? (On a scale from 1 to 5, where 5 means that the overall exposure of the promotional material is optimal.)

1 ☐

2 ☐

3 ☐

4 ☐

5 ☐

Comments:

Table 3: In-store Event

*Do not ask the following questions directly to the representative. Simply show interest in the product/event.*

| In-Store Event                                                               |     |    |     |          |
|------------------------------------------------------------------------------|-----|----|-----|----------|
| Section of the Store where the Event Takes Place                             |     |    |     | Comments |
| Location of the event (which section in the store)                           |     |    |     |          |
| Information Provided by the Representative                                   | Yes | No | N/A | Comments |
| Did the representative provide you with information on the products?         |     |    |     |          |
| Did the representative provide you with information on the discount offered? |     |    |     |          |
| Did you receive a free CFL?                                                  |     |    |     |          |
| Other Comments                                                               |     |    |     |          |

## 4.3 KNOWLEDGE OF THE PROGRAM AND PRODUCTS

*Note to mystery shopper: For the next section (Knowledge of the Program), ask 2 of the following 4 questions.*

### Knowledge of the Program

1. Are there discounts that apply to this type of product?

---

2. What is the amount of the discount?

---

3. Is it the same amount for all products?

---

4. Until when does the discount apply?

---

*Note to mystery shopper: For the Knowledge of Products section, ask both questions. On the other hand, ask question 5 only if the Energy Star logo is displayed.*

### Knowledge of Products

5. What does the ENERGY STAR logo mean? (Ask only if the ENERGY STAR logo is displayed.)

---

6. Could you tell me how these products (products eligible for the instant discount) differ from other products sold in your store?

---

## APPENDIX VIII - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the RMP. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>P3.</b> Before paying at the register, were you aware that a discount was offered on the purchase of specific packages of CFLs?                                                                                                                                                                                                               | IF 1. Yes : Ask FR1<br>IF 2 OR 9 : Go to FR2                                                                                                                     |
| <b>FR1.</b> Before learning about the discount on CFLs, did you have any specific plans to purchase CFLs?                                                                                                                                                                                                                                        | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                      |
| <b>FR1a.</b> I just want to make sure - <b>Before</b> learning about the discount on CFLs, you had already made the decision to purchase CFLs?                                                                                                                                                                                                   | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                    |
| <b>FR3.</b> If the discount had NOT been offered, how likely would you have been to buy the CFLs that you purchased with the discount of \$3 or \$5 offered by ENSC (Scale 0 to 10)                                                                                                                                                              | FR3 = Answer x 10%                                                                                                                                               |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                | <b>IF FR1 = 0% : FR3 / 2</b><br><b>IF FR1 = 100% ; FR3</b>                                                                                                       |
| <b>FR4a.</b> And if you had purchased the CFLs <b>without</b> the discount, would you have purchased...<br>1. Definitely the same number of CFLs?<br>2. Probably the same number of CFLs?<br>3. Probably less CFLs?<br>4. Definitely less CFLs?<br>9. (Don't know / Refused)                                                                     | IF 1: FR4a = 100%<br>IF 2: FR4a = 67%<br>IF 3: FR4a = 33%<br>IF 4. : FR4a = 0%<br>IF 9. : FR4a = 33%                                                             |
| <b>FR4b.</b> [If FR4a = 3 or 4] How many fewer CFLs would you have purchased <b>without</b> the discount? Just as a reminder, you mentioned that you purchased [#ES] CFLs for which you received a discount.                                                                                                                                     | FR4b                                                                                                                                                             |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                | <b>IF NUM. ANSWER TO FR4b: (#ES-FR4b) / #ES</b><br><b>OTHERWISE: FR4a</b>                                                                                        |
| <b>FR5.</b> If the discount had NOT been offered by the program, what is the likelihood that you would have purchased the same number of CFLs that you purchased <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                     | IF FR5 > 5 : ASK FR6<br>Otherwise: PA3 = EMPTY                                                                                                                   |
| <b>FR6.</b> Approximately how many months later would you have installed these products?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR6 = 100%<br>IF 2. : FR6 = 50%<br>IF 3. : FR6 = 25%<br>IF 4. : FR6 = 0%<br>IF 5. : FR6 = 0%<br>IF 6. : FR6 = 0%<br>IF 7. : FR6 = 0%<br>IF 9. : FR6 = 0% |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                | <b>FR6</b>                                                                                                                                                       |
| <b>FR7.</b> How influential was the discount offered by ENSC on your decision to purchase the CFLs you purchased this year? (Scale 0 to 10)                                                                                                                                                                                                      | FR7 = (10 – Answer) x 10%                                                                                                                                        |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                | <b>FR7</b>                                                                                                                                                       |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                      | <b>MEAN VALUE OF : (PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                   |

Subsequently, the final free-ridership level calculated for each participant was submitted to an inconsistency test. The inconsistency test consisted in verifying if  $(PA1 - PA4) \geq 30\%$ . In that case, the participant's answers to FR1 and FR7 represented an inconsistency and the smallest value between PA1 and PA4 was used in the final free-ridership calculation. Otherwise, PA1 and PA4 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.

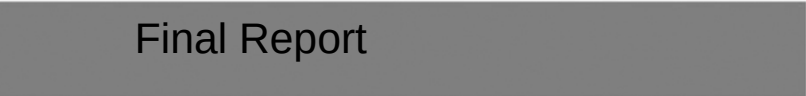




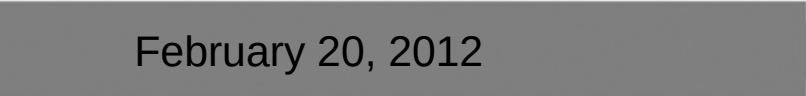
# **LED HOLIDAY LIGHTING EXCHANGE PROGRAM**

## **IMPACT EVALUATION 2007 TO 2011**

### **EFFICIENCY NOVA SCOTIA CORPORATION**



Final Report



February 20, 2012



**ECONOLER**



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## EXECUTIVE SUMMARY

This report presents the results of the 2007-2011 impact evaluation of the LED Holiday Lighting Exchange (LHLE) program.

## PROGRAM OVERVIEW

The LHLE program provides households with the opportunity to receive a free set of LED holiday lights in exchange for two sets of traditional incandescent lights in order to reduce electrical energy consumption and demand. The exchanges are made through local events held across Nova Scotia.

The LHLE program has run every fall since 2005. Since the 2007 Integrated Resource Plan (IRP), 46,399 LED holiday light sets have been handed out through the program and no evaluation has been conducted since the program started its activities. Therefore, this report aims to evaluate the electricity savings generated by the program since 2007.

## KEY FINDINGS

The 2007-2011 evaluation of the program demonstrated good results. Since 2007, the program has handed out a total of 46,399 LED holiday light sets and has generated net energy savings of 1.447 GWh.

To calculate the net savings of the program, Econoler reviewed the parameters used by ENSC to estimate program gross savings and took into consideration interactive effects for LED holiday lights. Due to the special nature of this program, the free-ridership and spillover effects were not measured during this evaluation and the net-to-gross ratio (NTGR) is assumed to be 1.

The evaluation revealed that the LHLE program had generated net energy savings of 1.447 GWh and demand savings of 3.618 MW at the generator from 2007 to 2011.

**Table 1: Comparison of Tracked and Evaluated Savings at the Generator (2007-2011)**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked savings from ENSC | 1.827 GWh             | 1.827 GWh                              | 1.00        | 1.827 GWh        |
| <b>Evaluation results</b> | <b>1.805 GWh</b>      | <b>1.447 GWh</b>                       | <b>1.00</b> | <b>1.447 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked savings from ENSC | 9.136 MW              | 9.136 MW                               | 1.00        | 9.136 MW         |
| <b>Evaluation results</b> | <b>4.512 MW</b>       | <b>3.618 MW</b>                        | <b>1.00</b> | <b>3.618 MW</b>  |

These net evaluated savings fell short of the tracked savings by 20.8 percent for energy savings and by 60.4 percent for demand savings. The addition of an interactive effects factor and the adjustment of the diversity and line loss factors explain this drop in savings.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The LHLE program is aimed at promoting the use of energy-efficient LED lights for holiday lighting. Through local events held annually from November to December across Nova Scotia, ENSC provided households with the opportunity to receive a free set of LED lights in exchange for two sets of traditional incandescent lights.

The LHLE program has run every fall since 2005. Since the 2007 Integrated Resource Plan (IRP), 46,399 LED holiday light sets have been handed out through the program. However, no evaluation has been conducted since the program started its activities and the savings generated were never computed. While the LHLE program is not a regular demand-side management (DSM) program, it is consistent with the approach approved by the Nova Scotia Utility and Review Board (UARB) for the 2012 DSM Plan. The latter was designed to account for the savings generated by programs that were outside regular DSM programs and not accounted for in the IRP load forecast.

This report aims to evaluate the electricity savings generated by the program from 2007 to 2011. The impact evaluation is based on a review of the parameters used in ENSC unitary savings calculations. Because of the short period targeted by the program and the relative level of savings it generated, ENSC has not planned any specific process evaluation activities for this evaluation.

## **2 IMPACT EVALUATION**

### **2.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the LHLE program from 2007 to 2011. To do so, Econoler reviewed ENSC unitary savings calculations by comparing them with those performed by other jurisdictions. Subsequently, the gross energy savings were calculated from this revised unitary savings value and the gross demand savings were calculated using a diversity factor. Finally, the program net savings were evaluated by applying the interactive effects generated by the replacement of traditional incandescent lights with LED lights.

### **2.2 GROSS SAVINGS**

The quantity of LED sets handed out during the program events was computed in the tracking sheet. Then, ENSC used an average unitary savings value to estimate the total energy and demand savings generated by the program.

#### **2.2.1 Unitary Savings Value**

The average unitary savings value estimated for each set of LED lights exchanged is 35.2 kWh and the unitary peak demand is estimated at 176 W. These values have been used by ENSC since 2007 to estimate the gross energy and demand savings generated by the program. They are based on the assumptions presented in the table below.

**Table 2: ENSC Unitary Savings Estimate for Each Set of LED Lights Exchanged**

| Parameters                                                            | Values                                                                                                            |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Proportion of old large incandescent sets returned (25 lamps per set) | 40%                                                                                                               |
| Proportion of old mini incandescent sets returned (100 lamps per set) | 40%                                                                                                               |
| Proportion of old mini incandescent sets returned (50 lamps per set)  | 20%                                                                                                               |
| Wattage of old large incandescent sets (25 lamps per set)             | $7 \text{ W/lamp} \times 25 \text{ lamps/set} = 175 \text{ W/set}$                                                |
| Wattage of old mini incandescent sets (100 lamps per set)             | $0.4 \text{ W/lamp} \times 100 \text{ lamps/set} = 40 \text{ W/set}$                                              |
| Wattage of old mini incandescent sets (50 lamps per set)              | $0.4 \text{ W/lamp} \times 50 \text{ lamps/set} = 20 \text{ W/set}$                                               |
| Average Old Wattage (incandescent sets)                               | $(40\% \times 175 \text{ W}) + (40\% \times 40 \text{ W}) + (20\% \times 20 \text{ W}) = 90 \text{ W/set}$        |
| Wattage of new LED sets (25 lamps per set)                            | $0.08 \text{ W/lamp} \times 25 \text{ lamps/set} = 2 \text{ W/set}$                                               |
| Average displaced wattage (per set returned)                          | $(90 \text{ W} - 2 \text{ W}) = 88 \text{ W}$                                                                     |
| Annual usage                                                          | $5 \text{ h/day} \times 40 \text{ days/yr} = 200 \text{ h/yr}$                                                    |
| Number of new LED sets used to replace the 2 old sets returned        | 2                                                                                                                 |
| <b>Unitary Energy Savings Value (per exchange)</b>                    | <b><math>2 \text{ sets/exchange} \times 88 \text{ W} \times 200 \text{ h/year} = 35.2 \text{ kWh/year}</math></b> |
| <b>Unitary Peak Demand (per exchange)</b>                             | <b><math>2 \text{ sets/exchange} \times 88 \text{ W} = 176 \text{ W}</math></b>                                   |

Through the LHLE program, ENSC offers one set of LED lights in exchange for two sets of traditional incandescent lights. However, ENSC calculates the unitary savings value associated with each LED set handed out based on the assumption that, ultimately, customers would probably replace both sets returned with new LED sets.

This assumption is conservative from two perspectives:

- > It assumes that only two sets of old incandescent lights are returned for every LED set handed out. However, in practice, the in-field teams see many customers bringing in multiple sets of old incandescent lights for only one LED set.
- > It also assumes that each set of old incandescent lights returned will ultimately be replaced even if it is possible that the customer will rather elect to use only the new set provided by ENSC.

On the other hand, it is also possible that a customer buys additional sets of holiday lights. In some cases, the old incandescent sets returned were longer and contained more lights. However, Econoler considers that ENSC's assumption remains conservative.

## Displaced Wattage

Based on in-field observation, ENSC established proportions of old sets returned for three different types of incandescent light sets. The wattages used for these different types of old sets returned were validated by reviewing the different studies presented in the table below.

**Table 3: Estimated Wattage Values for Old Incandescent Sets**

| Type of Lights     | Estimated Wattage | Source                                                   |
|--------------------|-------------------|----------------------------------------------------------|
| Large incandescent | 7.00 W            | Based on results from testing done by PG&E <sup>1</sup>  |
| Mini incandescent  | 0.45 W            |                                                          |
| Large incandescent | 7 and 5 W         | BC Hydro, Impact Evaluation – Seasonal LEDs <sup>2</sup> |
| Mini incandescent  | 0.40 W            |                                                          |
| Large incandescent | 5 W               | Ontario Power Authority Report <sup>3</sup>              |
| Mini incandescent  | 0.5 W             |                                                          |

These studies demonstrate that the wattage values used by ENSC for large and mini incandescent light sets are appropriate. Thus, no adjustment is needed.

The wattage used for the replacement set of LED lights provided by ENSC corresponds to the real wattage value of the C-6 LED lights offered through the program.

<sup>1</sup> Pacific Gas and Electric Company (PG&E), A Better Way to Light Up the Holidays, <http://www.pge.com>, 2012.

<sup>2</sup> Sampson Research, Market & Impact Evaluation of BC Hydro's Seasonal LED Initiative, Executive Summary prepared for BC Hydro, July 28, 2005.

<sup>3</sup> Ontario Power Authority (OPA), "2010 Prescriptive Measures and Assumptions" and "2011 Prescriptive Measures and Assumptions," [www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists](http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists).



## **Annual Usage**

For the hours of operation, Econoler found acceptable the annual usage of 40 days used by ENSC. While BC Hydro<sup>4</sup> and the OPA rather contemplate an annual usage of 31 days, corresponding to the entire month of December, other jurisdictions like the U.S. Department of Energy<sup>5</sup>, PG&E<sup>6</sup> and the University of Maine<sup>7</sup> consider an annual usage of 40 to 45 days to estimate the savings associated with the usage of LED holiday lighting. Moreover, most of these jurisdictions agree to use a daily usage of five hours. Therefore, Econoler decided to use ENSC's assumption of 40 days per year coupled with a daily usage of five hours, which represents an average value of all the studies mentioned above.

## **Unitary Savings Value**

Econoler's analysis of ENSC's assumptions used to estimate the program savings determined that the annual unitary savings value of 35.2 kWh per set of LED lights handed out is reasonable. As a result, this value was used in the evaluation to compute the gross energy savings achieved between 2007 and 2011. In the same way, the unitary peak demand estimated at 176 W was used to calculate demand savings.

### **2.2.2 Diversity Factor**

In the tracking sheet, ENSC estimated program gross demand savings by using a diversity factor of 100 percent. However, Econoler considers that this assumption is not conservative considering that the peak electricity demand for Nova Scotia Power is expected to occur between 5 p.m. and 7 p.m. on a weekday in December, January or February. The probability that the LED holiday lights will be turned on during these three months is not 100 percent.

In order to estimate the diversity factor, Econoler evaluated the probability that the LED holiday lights would be turned on at the time of the peak electricity demand for Nova Scotia Power. To do so, the Evaluator considered two elements: the probability that the holiday lights would be turned on between 5 p.m. and 7 p.m. and the probability that they would be turned on the day of the peak load, which should occur on a weekday in December, January or February. Since the program assumptions indicated that the LED holiday lights would be turned on about five hours a day and that it would usually be in the evening, there was a high probability that the lights would be turned on between

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<sup>4</sup> BC Hydro, Make your Holiday Season Bright and Energy Efficient!, Power Smart program, <http://www.bchydro.com>, October 2010.

<sup>5</sup> U.S. Department of Energy, LED Products, Energy Savers, [www.energysavers.gov](http://www.energysavers.gov), Last Update: 2012-01-11.

<sup>6</sup> PG&E, A better Way to Light Up the Holidays, [www.pge.com](http://www.pge.com).

<sup>7</sup> The University of Maine, LED Alternatives Offer Efficient Holiday Lighting, [www.umaine.edu](http://www.umaine.edu), November 29, 2010.

5 p.m. and 7 p.m. Thus, that probability was estimated at 100 percent. Furthermore, the program assumed that the LED holiday lights were used, on average, 40 days per year during the month of December and the beginning of January. Knowing that, Econoler evaluated the probability that the LED holiday lights would be turned on the day of the peak load. Based on Nova Scotia Power historical peak load data<sup>8</sup>, it appears that, in 50 percent of cases, the peak load occurred during the month of December. Therefore, a diversity factor of 50 percent was used in the demand savings calculations for the LHLE program.

### 2.2.3 Total Gross Savings

The program gross savings for the years 2007 to 2011 are presented in the table below. They were calculated using the unitary savings value validated during this evaluation and using the number of LED sets handed out through the program from 2007 to 2011. For the five years evaluated, the total gross energy and demand savings amount to 1.633 GWh and 4.083 MW at the meter.

Between the meter and the generator, the line loss factor for the residential sector is estimated by Nova Scotia Power at 1.1050. Using this value, total gross energy and demand savings are estimated at 1.805 GWh and 4.512 MW at the generator level.

**Table 4: Evaluation Results – Total Gross Energy Savings**

| <b>Energy Savings</b>                                  | <b>2007</b>  | <b>2008</b>  | <b>2009</b>  | <b>2010</b>  | <b>2011</b>  | <b>Total</b> |
|--------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Number of LED sets – from tracking sheet               | 5,622        | 7,475        | 10,223       | 10,075       | 13,004       | 46,399       |
| Unitary energy savings value (kWh)                     | 35.2         | 35.2         | 35.2         | 35.2         | 35.2         | 35.2         |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>0.198</b> | <b>0.263</b> | <b>0.360</b> | <b>0.355</b> | <b>0.458</b> | <b>1.633</b> |
| Line loss factor                                       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>0.219</b> | <b>0.291</b> | <b>0.398</b> | <b>0.392</b> | <b>0.506</b> | <b>1.805</b> |
| <b>Demand Savings</b>                                  |              |              |              |              |              |              |
| Number of LED sets – from tracking sheet               | 5,622        | 7,475        | 10,223       | 10,075       | 13,004       | 46,399       |
| Unitary peak demand (W)                                | 176          | 176          | 176          | 176          | 176          | 176          |
| Diversity factor                                       | 50%          | 50%          | 50%          | 50%          | 50%          | 50%          |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.495</b> | <b>0.658</b> | <b>0.900</b> | <b>0.887</b> | <b>1.144</b> | <b>4.083</b> |
| Line loss factor                                       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.547</b> | <b>0.727</b> | <b>0.994</b> | <b>0.980</b> | <b>1.265</b> | <b>4.512</b> |

<sup>8</sup> Nova Scotia Power, Hourly Total Net Nova Scotia Load,  
[http://oasis.nspower.ca/en/home/default/monthlyreports/hourly\\_ns.aspx](http://oasis.nspower.ca/en/home/default/monthlyreports/hourly_ns.aspx), visited on February 5, 2012.

## 2.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the LHLE program, replacement of traditional holiday lights with LED holiday lights inside the house causes an increase in the heating load during their use. Indeed, LED lights release less heat than the traditional incandescent lights they replace.

The interactive effects on electric heating for LED holiday lights are estimated at -100 percent when they are installed inside the house. This assumption is based on the fact that holiday lighting is installed during winter (heating season), in common rooms, at medium-high and when no air conditioning unit is used. Therefore, 100 percent of the energy released from the holiday lights is used for the heating load. Similar discussions were held a few years ago with Hydro-Québec for its holiday lighting program and it was agreed to remove any impact for electrically heated houses. Only external holiday lighting was promoted and considered for the energy savings.

The table below presents the calculation details for the interactive effects factor. It reflects the proportion of residences in Nova Scotia that use electricity as a main heating source and the percentage of residences where seasonal LED lights were installed inside the house. According to a survey conducted by ENSC with 1,004 respondents, 33 percent of households in Nova Scotia use electricity as a main heating source for their home<sup>9</sup>. To determine the indoor/outdoor installation ratio, Econoler assumed that the sets of LED lights that replaced large incandescent lights had been installed outside. Those sets represented 40 percent of the sets handed out. The remaining sets, replacing mini incandescent lights, were considered to be used for indoor holiday decoration.

**Table 5: Interactive Effects Factor for the LED Holiday Lighting Program**

| Parameters                                               | % of Residences             | Interactive Effects |
|----------------------------------------------------------|-----------------------------|---------------------|
| Using electric heating – indoor seasonal LED lights      | $33\% \times 60\% = 19.8\%$ | -100%               |
| Using electric heating – outdoor seasonal LED lights     | $33\% \times 40\% = 13.2\%$ | 0%                  |
| Not using electric heating – indoor seasonal LED lights  | $67\% \times 60\% = 40.2\%$ | 0%                  |
| Not using electric heating – outdoor seasonal LED lights | $67\% \times 40\% = 26.8\%$ | 0%                  |
| <b>Weighted Interactive Effects Factor</b>               | <b>100%</b>                 | <b>-19.8%</b>       |

<sup>9</sup> ENSC from socket study.

## 2.4 NET-TO-GROSS RATIO

Due to the special nature of this program, the short period targeted and the fact that it requires a particular implication from the participant, the distortion effects of the program are assumed to be negligible. Consequently, the NTGR is assumed to be 1 for this program.

## 2.5 NET SAVINGS

Since the NTGR for the program is assumed to be 1, the net savings were calculated using the interactive effects only.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive effects factor})$$

The net energy savings were calculated separately for each year, as shown in the table below. Overall, the total net energy and demand savings from 2007 to 2011 amount to 1.310 GWh and 3.275 MW at the meter, and 1.447 GWh and 3.618 MW at the generator.

**Table 6: Evaluation Results – Total Net Savings**

| Energy Savings                                        | 2007         | 2008         | 2009         | 2010         | 2011         | Total        |
|-------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Total gross energy savings – at meter (GWh)           | 0.198        | 0.263        | 0.360        | 0.355        | 0.458        | 1.633        |
| Interactive effects factor                            | -19.8%       | -19.8%       | -19.8%       | -19.8%       | -19.8%       | -19.8%       |
| NTGR                                                  | 1.00         | 1.00         | 1.00         | 1.00         | 1.00         | 1.00         |
| <b>Total Net Energy Savings – at Meter (GWh)</b>      | <b>0.159</b> | <b>0.211</b> | <b>0.289</b> | <b>0.284</b> | <b>0.367</b> | <b>1.310</b> |
| Line loss factor                                      | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       |
| <b>Total Net Energy Savings – at Generator (GWh)</b>  | <b>0.175</b> | <b>0.233</b> | <b>0.319</b> | <b>0.314</b> | <b>0.406</b> | <b>1.447</b> |
| Demand Savings                                        |              |              |              |              |              |              |
| Total gross demand savings – at meter (MW)            | 0.495        | 0.658        | 0.900        | 0.887        | 1.144        | 4.083        |
| Interactive effects factor                            | -19.8%       | -19.8%       | -19.8%       | -19.8%       | -19.8%       | -19.8%       |
| NTGR                                                  | 1.00         | 1.00         | 1.00         | 1.00         | 1.00         | 1.00         |
| <b>Total Gross Demand Savings – at Meter (MW)</b>     | <b>0.397</b> | <b>0.528</b> | <b>0.721</b> | <b>0.711</b> | <b>0.918</b> | <b>3.275</b> |
| Line loss factor                                      | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       | 1.1050       |
| <b>Total Gross Demand Savings – at Generator (MW)</b> | <b>0.438</b> | <b>0.583</b> | <b>0.797</b> | <b>0.786</b> | <b>1.014</b> | <b>3.618</b> |

As shown below, the gross and net savings resulting from this evaluation were compared to the gross and net savings estimates from the 2011 tracking sheet.

**Table 7: Comparison of Tracked and Evaluated Savings at the Generator (2007-2011)**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked savings from ENSC | 1.827 GWh             | 1.827 GWh                              | 1.00        | 1.827 GWh        |
| <b>Evaluation results</b> | <b>1.805 GWh</b>      | <b>1.447 GWh</b>                       | <b>1.00</b> | <b>1.447 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked savings from ENSC | 9.136 MW              | 9.136 MW                               | 1.00        | 9.136 MW         |
| <b>Evaluation results</b> | <b>4.512 MW</b>       | <b>3.618 MW</b>                        | <b>1.00</b> | <b>3.618 MW</b>  |

To establish energy and demand savings, Econoler used the unitary savings and peak demand values computed in the tracking sheet. The fact that the evaluated results are below tracked savings can be explained by the adjustment of the following factors:

- > The interactive effects factor: Interactive effects were not taken into account in the tracking sheet. However, Econoler considers that the interactive effects on the heating load caused by the replacement of traditional holiday lights with LED holiday lights are not negligible. The interactive effects factor for the LHLE program was estimated at -19.8 percent by the Evaluator and was used in the net savings calculations.
- > The diversity factor: ENSC used a diversity factor of 100 percent in the tracking sheet to estimate program demand savings. This value was adjusted to 45 percent by Econoler considering the probability that the LED holiday lights would be turned on during the peak electricity demand.
- > The line loss factor: In the tracking sheet, ENSC used a line loss factor of 1.1188, as in the 2010 evaluation. The line loss factor for the residential sector was updated this year to 1.1050.

The addition of interactive effects and the adjustment of the diversity and line loss factors allowed for a more precise estimation of program energy and demand savings. Following these adjustments, net program savings amount to 1.447 GWh and 3.257 MW of net demand savings.



# **EFFICIENT PRODUCTS – LOW INCOME RENTER PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 20, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Low Income Renter (LIR) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM), a delivery agent (DA) and a contractor as well as on 15 on-site visits and a telephone survey of 70 program participants.

## **PROGRAM OVERVIEW**

The LIR program was launched in 2011 as a pilot. Under the program, Efficiency Nova Scotia Corporation (ENSC) collaborates with municipal and provincial housing authorities across Nova Scotia to install energy-efficient products in the low-income rental market. The program specifically targets renters living in subsidized housing. The LIR was designed to address various needs pinpointed by stakeholders of the low-income rental market. Such needs include, among others, achieving energy efficiency upgrades in homes and providing further information on energy-efficient behaviours.

In order to be eligible, participants need to reside in one of the selected subsidized housing locations and pay all or a portion of their own power bill or be charged a fee by the housing authority based on their electricity usage.

The products installed through the program are:

- > compact fluorescent lamps (CFLs);
- > CFL compatible floor lamps (CFL torchieres);
- > power bars with integrated timer;
- > light-emitting diode (LED) nightlights;
- > seasonal LED lights;
- > insulating hot water tank wraps;
- > pipe insulation;
- > faucet aerators; and
- > low-flow showerheads.

The LIR program aimed to achieve net electricity savings of 4.38 GWh and demand savings of 0.98 MW for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the LIR program demonstrated that the program has a good potential for success considering that it was a pilot and that it targeted a market that had not been explored before. The program totalled 4,920 participants for the year 2011. In terms of net energy savings, the program generated 4.809 GWh at the generator.

### **Program Barriers**

The program partners contacted during the in-depth interviews were asked to indicate program barriers or participant concerns encountered during the year 2011. First, they identified the main program barrier as being the limited number of participants as a result of the few eligible leads provided by housing authorities.

Second, the program partners identified the most common program concern as being related to CFLs (too dim, presence of mercury, etc.). During the telephone survey, the participants were also asked to share their concerns about the program. It appears that only one respondent out of 70 has concerns about the presence of mercury in CFLs. Therefore, according to participants' responses, health risks associated with the products installed through the program do not constitute a significant barrier. However, the program partners' declaration should not be ignored as this barrier could become relevant in the future. Considering that the LIR program is new, barriers are bound to change along the way.

### **Satisfaction**

Satisfaction towards the program is high among participants. They mainly justified their satisfaction with the fact that their energy bill has lowered since their participation. The program partners interviewed also mentioned being very satisfied with the program.

Even though most participants were satisfied, some of them did remove certain products that had been installed through the program. On-site visits revealed that for 11 of the 15 sites visited, at least one product had been removed.

### **Program Energy Savings**

To calculate the net savings of the LIR program in 2011, Econoler reviewed the source of data and the parameters used in ENSC's unitary savings estimations for each product category. Moreover, Econoler calculated installation rates using results from the on-site visits and included interactive effects for lighting products, pipe insulation and hot water tank wraps. Due to the nature of the products offered under the LIR program and the target customers, the distortion effects of the program

were assumed to be insignificant. Consequently, the net-to-gross ratio (NTGR) for this program was assumed to be 1.

Using the revised unitary savings values, the installation rates and the interactive effects factors, the evaluation revealed that the LIR program had generated net energy savings of 4.809 GWh and demand savings of 1.078 MW at the generator in 2011.

**Table 1: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 5.156 GWh             | 5.156 GWh               | 5.156 GWh                                        | 1.00        | 5.156 GWh        |
| <b>Evaluation Results</b> | <b>5.550 GWh</b>      | <b>5.492 GWh</b>        | <b>4.809 GWh</b>                                 | <b>1.00</b> | <b>4.809 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 1.156 MW              | 1.156 MW                | 1.156 MW                                         | 1.00        | 1.156 MW         |
| <b>Evaluation Results</b> | <b>1.244 MW</b>       | <b>1.231 MW</b>         | <b>1.078 MW</b>                                  | <b>1.00</b> | <b>1.078 MW</b>  |

These net evaluated savings fell short of those tracked by ENSC by 7 percent. The addition of an installation rate for power bars with integrated timer and interactive effects are the main factors that explain this realization rate. Moreover, while some adjustments were applied to the unitary savings estimates used in the tracking sheet, they were in most cases revised upward. The table below shows such changes.

**Table 2: 2011 Program Unitary Savings Adjustments**

| Products                         | Unitary Savings Values (kWh/year) |           |
|----------------------------------|-----------------------------------|-----------|
|                                  | Tracked                           | Evaluated |
| 13 watt CFLs                     | 41                                | 46.3      |
| 23 watt CFLs                     | 41                                | 69.5      |
| CFL torchieres                   | 241                               | 69.5      |
| LED nightlights                  | 26                                | 29.3      |
| Seasonal LED lights              | 17.52                             | 17.52     |
| Faucet aerators                  | 86                                | 176.3     |
| Low-flow showerheads             | 157                               | 377       |
| Power bars with integrated timer | 53                                | 53        |
| Pipe insulation                  | 74                                | 74        |
| Hot water tank wraps             | 399                               | 270       |

## RECOMMENDATIONS

Econoler found that the program is well on its way to becoming successful. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- LIR-R1. Monitor program barriers and participant concerns:** To make sure to go forward with the program and in the right direction, program barriers and participant concerns will have to be watched closely. They should be monitored frequently to adjust program components or the marketing strategy and ensure that they are addressed properly. For example, the presence of mercury in CFLs was brought up as a program barrier by partners, but was not confirmed by participants. However, if the perceived health risk becomes a more important barrier among participants, ENSC could develop a brochure to better inform the participants about the technologies installed.
- LIR-R2. Improve measure sustainability:** The on-site visits revealed that some of the products installed through the program were often removed after installation or used in a way that did not allow for the achievement of energy savings. To maintain the sustainability of the products installed, Econoler recommends giving participants more information on the products promoted through the program. More specifically, more information on the benefits of LED nightlights and faucet aerators as well as on how to use power bars with integrated timer should be given to participants. This strategy could help participants use the products correctly and prevent them from removing the products as they would be aware of all product advantages. It is to be noted that, for the most installed product (CFLs), only 1.6 percent were removed after installation, showing a high level of sustainability.
- LIR-R3. Increase the number of on-site visits to validate product installation:** During the 15 on-site visits conducted for this evaluation, Econoler noted that a removal phenomenon existed for CFLs, and more significantly for LED nightlights and faucet aerators. However, the number of on-site visits was not sufficient to establish an installation rate that could be applied to all the products installed through the program. For the next evaluation, Econoler recommends increasing the number of on-site visits in order to have a reasonable precision level that would allow for the establishment of installation rates for CFLs, LED nightlights and faucet aerators.

- LIR-R4. Collect additional information to allow for a more precise evaluation of savings:**
- The PM, together with the evaluator, should determine what fields are necessary for administration and evaluation purposes. There are two fields in the tracking sheet that are not filled systematically: the percentage of electric space heating and the hot water heating type. These two fields would be useful for the impact evaluation, more specifically for estimating interactive effects, and should be added to the data gathering protocol. In addition, information on the use of air conditioning, which would allow a more precise estimation of interactive effects factors, should also be added to the data gathering protocol. In the case of lighting products, the power of old lamps replaced is another element that could be relevant for validating the baseline case and for ensuring that the new lamps installed actually replaced less efficient lamps. At first, Econoler had planned to validate such information during on-site visits but participants did not know the exact wattage of the old lamps replaced in their home.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

Efficiency Nova Scotia Corporation (ENSC) launched the Low Income Renter (LIR) program as a pilot in March 2011. This program works with municipal and provincial housing authorities across Nova Scotia to install efficient products in the low-income rental market. Consultation with stakeholders specializing in low-income energy concerns identified the need for a program targeting low-income renters. The LIR program was designed to address this need and was modeled from the direct install component of the Low Income program.

The program began working strictly with renters living in subsidized housing by leveraging relationships with the provincial and municipal housing authorities. It has then expanded to include mini-home parks.

Summerhill Group is the delivery agent of the program. The products installed through the program are compact fluorescent lamps (CFLs), CFL-compatible floor lamps, power bars with integrated timer, light-emitting diode (LED) nightlights, seasonal LED lights, insulating domestic hot water tank wraps, pipe insulation, faucet aerators and low-flow showerheads.

The LIR program was designed as a first test of entering the low-income rental market. It is anticipated that the program will be offered to the wider rental market in 2012.

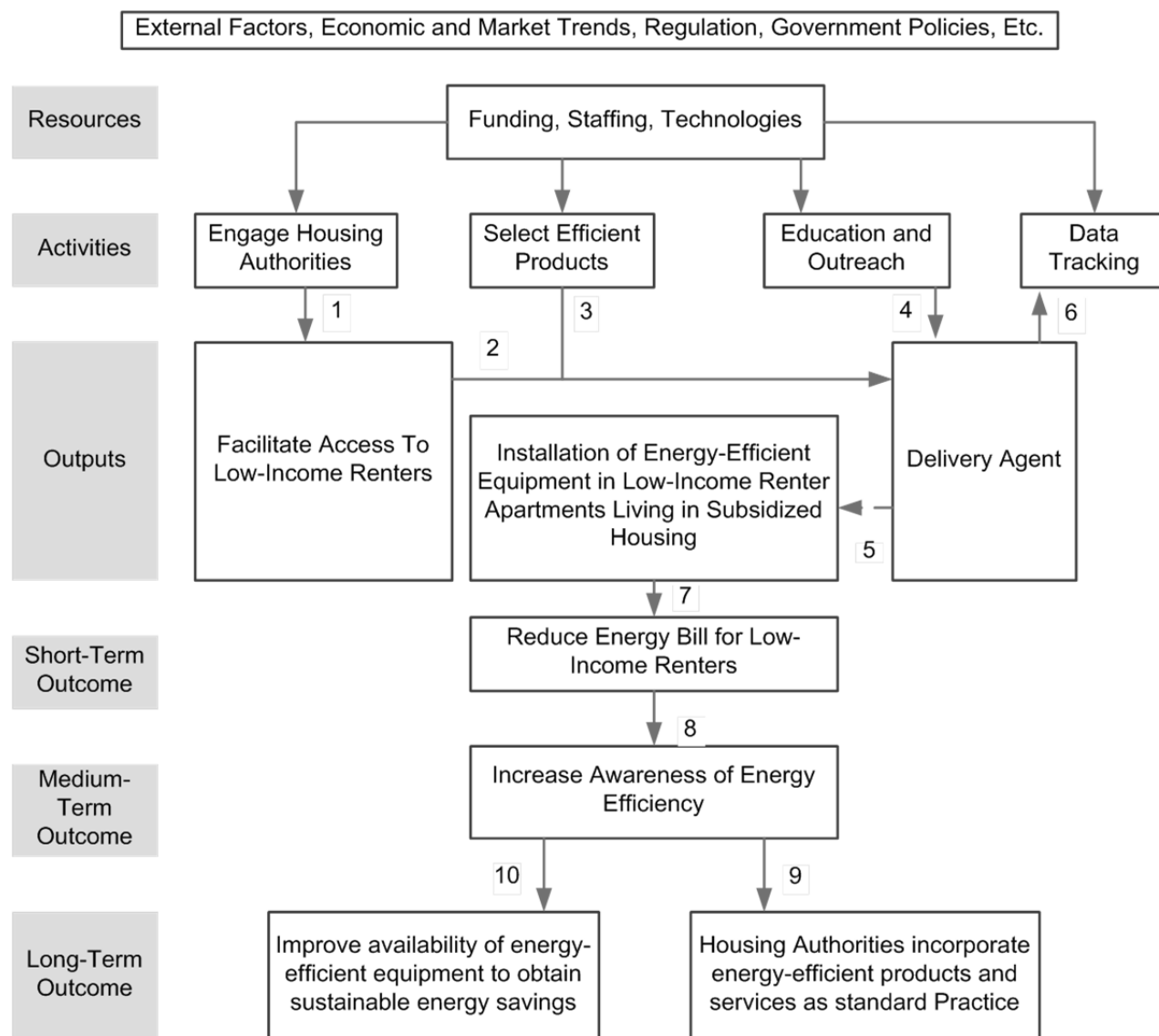
The LIR program aimed to achieve net electricity savings of 4.38 GWh and demand savings of 0.98 MW for the year 2011.



## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Efficient Products – Low Income Renter Program Logic Model<sup>1</sup>**



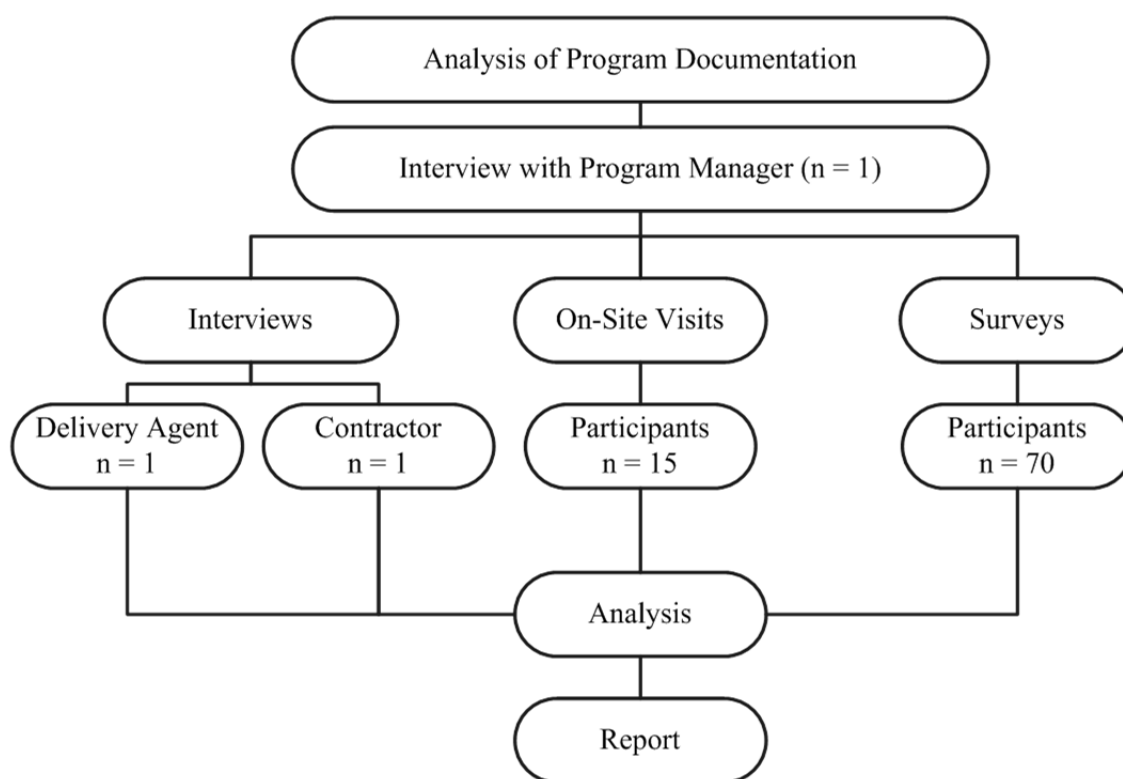
<sup>1</sup>The numbers 1 through 10 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices IV, V and VI.

**Figure 2: Methodological Model**



## 2.2 METHODOLOGY DESCRIPTION

### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the LIR program was the analysis of the program documentation. At this stage, all available program information was reviewed. The information used to conduct this analysis was primarily obtained from the following three sources:

- > ENSC website;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart; and
- > role of the program partners.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interviews for the process evaluation was finalized.

### **2.2.3 In-Depth Interviews with Program Partners**

#### **Interview with Delivery Agent**

In September, one in-depth interview was conducted with the program delivery agent (DA). This interview was intended, among other things, to understand the DA's involvement in the program, their participation process in the program, more specifically during direct installation visits, and their perception and satisfaction with the program.

#### **Interview with the Subcontractor of the Delivery Agent**

In September, one in-depth interview was conducted with the DA's subcontractor. This interview was intended, among other things, to understand the subcontractor's involvement in the program, their participation process in the program and their perception and satisfaction with the program.

### **2.2.4 On-Site Visits**

In October and November, 15 on-site visits were conducted at households where energy-efficient products had been installed by the DA. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These visits were used to validate the installation of the products in accordance with the data found in the tracking sheet and, when such was the case, to establish the reason for removing them after their installation. Moreover, technical information was collected through on-site observations or tenant interviews to validate the unitary savings assumptions used for each category of products.

The methodology used for the on-site visits under the LIR program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VII.

### 2.2.5 Participant Survey

A telephone survey with a total of 70 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was nine minutes.

The participant survey was used to gain a better understanding of the following program features:

- > participant motivations and barriers;
- > impact of program;
- > satisfaction with the program; and
- > recommendations for improvements.

The demographic profile of survey respondents is shown in Appendix III. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2011 telephone survey.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population         | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|--------------------|-----------------|-------------------------------------------|
| 2011 Participants | 4,920 <sup>2</sup> | 70              | ±9.7%                                     |

---

<sup>2</sup> The population for the 2011 survey included 1,887 participants (1,689 participants with no missing names, phone numbers, or both), which was the number of program participants at the time of conducting the survey.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the LIR program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

This process evaluation was performed through interviews with the PM and with the program partners, as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

Since the LIR program is new and is still a pilot, the program manual features very little information. It is mentioned though that a more exhaustive manual will be produced once the program is officially launched.

There is no perfect example of program manual content. Indeed, program manuals are usually custom-designed to meet an organization's specific needs. However, standard components are usually included in program manuals intended for internal use. The table below lists the information found in the LIR program manual.

**Table 4: Program Manual Content**

| <b>Program Manual Content</b>                                                                                | <b>LIR Program Manual</b> |
|--------------------------------------------------------------------------------------------------------------|---------------------------|
| Document revisions                                                                                           | N/A                       |
| Program description (including nature or type of program)                                                    | ✓                         |
| Program justification                                                                                        | ✓                         |
| Program objectives                                                                                           | ✓                         |
| Incentives                                                                                                   | N/A                       |
| Eligibility criteria                                                                                         | ✓                         |
| Program partners and their roles                                                                             | ⚠                         |
| Program barriers                                                                                             | ✓                         |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                         |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                          | LIR Program Manual |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Details about the savings calculations and type of products                                                                                                                                                                                                                                                                                                                     | ✓                  |
| Budget per year                                                                                                                                                                                                                                                                                                                                                                 | ✓                  |
| Cost-effectiveness test results                                                                                                                                                                                                                                                                                                                                                 | ⊘                  |
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                                   | ⊘                  |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                                  | ⊘                  |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                                 | ⊘                  |
| Program theory                                                                                                                                                                                                                                                                                                                                                                  | ✓                  |
| Logic model                                                                                                                                                                                                                                                                                                                                                                     | ⊘                  |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                      | ✓                  |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                       | ⊘                  |
| Program forms                                                                                                                                                                                                                                                                                                                                                                   | ✓                  |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                    |

Econoler analyzed the LIR program manual. It contains relevant information useful for both the PM and the Evaluator. However, Econoler has the following recommendations in order to supplement and improve the tool:

> **Document important program practices:**

- The disposal of old products should be documented in the program manual to have a complete description of the implementation process.
- There are no instructions related to the source of energy used for space heating and water heating when installing hot water tank wraps. This information should be mentioned in the program manual to avoid any errors. Similarly, the program manual should also mention the guidelines for the installation of lighting products and the fact that it should be replacing a less efficient lamp.

- > **Provide a “base case”:** The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and update purposes.
- > **Provide the parameters used to estimate program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but some important information is missing that would allow it to serve as the “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of the tracking sheet for the LIR program. The tracking sheet presents information in two separate sheets: one lists customer information and the other the products installed. Each project has a unique identification number which links customer participation to the type of product installed.

In general, the tracking sheet is easy to use and contains the necessary fields for program administration and evaluation purposes. It provides the PM with a way to continuously monitor the number of each type of product installed and the related energy savings. However, in a few cases, the customer information necessary for conducting field activities (surveys and on-site visits) is missing.

Energy savings are entered in the tracking sheet with a formula referring to a table in which the unitary savings are listed for each product. These unitary savings values come from the 2010 evaluation, except for the new products added to the program this year whose values come from a study conducted by Navigant Consulting. In the case of CFLs, 13-watt and 23-watt lamps are identified with two different product numbers in the tracking sheet. However, the savings associated with both types of CFLs are the same, which will be revised in the 2011 impact evaluation.

The program tracking sheet was also evaluated by the PM during the interview. The PM is satisfied with the tracking sheet and considers it easy to use.

Although the tracking sheet is considered relatively complete and sufficient for program monitoring, some improvements could be made to facilitate future program evaluation. The evaluator recommends the following:

- > **Collect additional information on the products installed:** The PM, together with the evaluator, should determine what fields are necessary for administration and evaluation purposes and ensure the information is systematically entered for these fields. There are two fields in the tracking sheet that are not filled: the percentage of electric space heating and the hot water heating type. These two fields could be useful for the impact evaluation, more specifically for estimating interactive effects, and should be added to the data gathering protocol. In addition, information on the use of air conditioning units or system, which would allow a more precise estimation of interactive effects factors, should also be added to the data gathering protocol. In the case of lighting products, another element that could be relevant to have is the type, power and number of old lamps. This information could be used for validating the baseline case and for ensuring that the new lamps installed actually replaced less efficient lamps.
- > **Ensure that all customer information is filled in systematically:** Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. A protocol could be implemented to ensure that all information is collected and entered in the tracking sheet. There were a few entries missing in the customer tracking sheet, such as customer names, postal codes and phone numbers. This information is essential for conducting evaluation activities such as customer surveys and on-site visits. In the future, ENSC should ensure that these fields are filled in for all customers.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program tools, the Evaluator concludes that the program is well designed and has potential for success. Overall, the program totalled 4,920 participants. The collaboration between ENSC and the municipal and provincial housing authorities across Nova Scotia to facilitate access to renters helped raise program participation. However, Econoler has the following recommendations on the design and delivery of the program:



- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PA are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Keep the program name consistent:** The Evaluator has noticed that program documentation carries two different names: Low Income Direct Install, which was the original name in the initial proposal and Low Income Renter, which is the formal program name. For evaluation purposes, and to avoid confusion in the market, the Evaluator recommends keeping the same program name in program documentation and ensuring that all program partners use the formal program name.

### **3.5 RELATIONSHIP WITH PARTNERS**

Two program partners were interviewed under the process evaluation of the LIR program: the DA and the DA's subcontractor. Both of them are very satisfied with their relationship with ENSC's team as well as the overall program.

One aspect of the program that still leaves room for improvement according to the DA is the marketing and outreach activities. Despite the DA's involvement in the program marketing strategy, concerns were expressed about this aspect of the program. The DA mentioned specifically the difficulty of working with a third party marketing provider. The latter seems, according to the DA, inexperienced in delivering conservation programs, which leads to sub-par marketing material.

The DA also declared that the implementation process is complex and requires major changes to the way they work. Those changes are mainly caused by many mid-course adjustments related to the design and delivery, which is to be expected in a new program, as well as increasing savings targets for ENSC. On the other hand, the implementation process is considered simple by the DA's subcontractor. The subcontractor also mentioned that changing the program name was a good strategy since it helped differentiate this program from other ENSC low-income programs.

According to the program partners, the main barrier to the implementation of the LIR program is the limited demand due to the low number of leads provided by the housing authorities. Tenants' reluctance over new products is also identified as a barrier to the program. The most common concerns are related to CFLs (too dim, presence of mercury, etc.). Questions to investigate these barriers were included in the participant survey. It appears that only one respondent out of 70 has

concerns about the presence of mercury in CFLs. Program barriers should be frequently monitored to adjust the program components or the marketing strategy and ensure that the barriers are addressed. For example, if the perceived health risk becomes a more important barrier, ENSC could provide a brochure to better inform the participants about the technologies installed.

In order to improve program performance, the DA suggests working off the customer database from NSPI to determine eligible and interested participants. It would be the best way to ensure that the right customers are targeted. However, ENSC will have to determine if this information is obtainable through NSPI.

## 3.6 PARTICIPANT PERSPECTIVES

This section shows the results of the telephone survey conducted with a total of 70 program participants. It is to be noted that survey results must be interpreted with caution since the particular market of low-income housing is a population difficult to survey. Furthermore, some inconsistencies in respondents' answers were sometimes observed.

### 3.6.1 Participation Motivations and Barriers

The main reason for participating in the LIR program, which is identified as the single most important reason by six in 10 respondents, is to save on energy costs and bills (64%). In addition to this, a variety of other reasons are offered by a minority of participants, including the fact that the other units in their building were included in the program (13%).

**Table 5: Reasons for Participating in the LIR Program**

| Reasons for Participating                 | 2011                                |                      |
|-------------------------------------------|-------------------------------------|----------------------|
|                                           | <i>Single Most Important Reason</i> | <i>Other Reasons</i> |
| <i>Sample Size</i>                        | 70                                  | 65                   |
| To save on energy costs/bills             | 64%                                 | 9%                   |
| They were doing all the units/everyone    | 13                                  | --                   |
| Wanted to see how it works                | 6                                   | 2                    |
| It was offered/made available             | 4                                   | 2                    |
| To receive free compact fluorescent lamps | 3                                   | 2                    |
| No cost for services/program was free     | 1                                   | 2                    |
| To help the environment                   | 1                                   | 2                    |
| To receive free power bars                | --                                  | 2                    |
| To receive free LED lights                | --                                  | 2                    |
| Other                                     | --                                  | 2                    |
| Nothing                                   | --                                  | 15                   |
| Refused                                   | --                                  | 5                    |
| Don't know                                | 7                                   | 65                   |

The vast majority of participants did not have any concerns about taking part in the program prior to participating (93%). Out of the two respondents who did, one expressed specific concerns regarding health risks that could be caused by the offered products.

**Table 6: Concerns About Participating in the LIR Program**

| Concerns           | 2011 |
|--------------------|------|
| <i>Sample Size</i> | 70   |
| Yes                | 3%   |
| No                 | 93   |
| Don't know         | 4    |

### 3.6.2 Removal of Energy Efficiency Products

Respondents were asked whether they had chosen to remove any of the energy efficiency products installed through the program. Since the installation, most surveyed participants stated that they had kept all installed products (89%), as just under one in 10 indicated having removed at least one product (7%).

When it comes to product removal, there is often a bias between self-declaration and what is found on the field, which is exactly what the on-site visits revealed. In most of the sites visited (11 out of 15), the Evaluator found that participants had removed at least one product installed through the program (see Section 4.2.10 for additional information). However, in most cases, only one non-conformity was observed and CFLs, which is the most installed product category, were removed in one site only.

To maintain the sustainability of the products installed, the Evaluator recommends giving more information to participants about the features and benefits of the products. Furthermore, benefits other than financial should be mentioned in order to convince all tenants of the advantages of the products, even those who do not pay for their electricity bill or pay only a portion.

**Table 7: Removal of Energy Efficiency Products Post-Program**

| Efficiency Products Removed | 2011 |
|-----------------------------|------|
| <i>Sample Size</i>          | 70   |
| Yes                         | 7%   |
| No                          | 89   |
| Don't know                  | 3    |
| Refused                     | 1    |

From the very few participants who indicated having removed at least one energy-efficient product post-program ( $n = 5$ ), two removed their low-flow faucet aerators, citing a difference in expectations about how the product operates. One participant removed CFLs, after having concerns that the lamps might pose health risks while another removed LED nightlights for aesthetic reasons.

### 3.6.3 Impact of Program

Six in 10 program participants indicated having changed their behaviour in terms of how they use energy at home as a result of the information they received during the energy-saving products installation visit (60%). Specifically, over one-half now turn off their lights (55%) and one-quarter turn off appliances (24%), while, similarly, one in 10 indicates turning off or unplugging items that are not being used (12%). Just over one in 10 believes being more aware of power usage (14%).

**Table 8: Information Received Changed Energy Use Behaviour**

| <b>Changed Behaviour</b>             | <b>2011</b> |
|--------------------------------------|-------------|
| <i>Sample Size</i>                   | 70          |
| Yes                                  | 60%         |
| No                                   | 34          |
| Don't know                           | 6           |
| <b>Specific Changes in Behaviour</b> | <b>2011</b> |
| <i>Sample Size</i>                   | 42          |
| Turn off lights now                  | 55%         |
| Turn off appliances                  | 24          |
| More aware of power usage            | 14          |
| Turn off/unplug items not being used | 12          |
| Use timers to shut things off        | 5           |
| Use less hot water to wash clothes   | 5           |
| Hang clothes to dry                  | 5           |
| Close doors and windows              | 2           |
| Other                                | 17          |
| Don't know                           | 14          |

Just under four in 10 participants indicated that the products installed were successful in lowering their energy bills (37%). However, a comparable proportion did not notice a change in their energy bills (30%), while one in 10 believed that bills went up (11%). When interpreting these results, it should be noted that energy-efficient products were installed quite shortly before the survey. In fact, a sizeable minority indicated that they did not know (14%) or that it was too soon to tell (7%) whether changes had occurred in the energy bills since the installation of energy-efficient products. Moreover, many other factors not investigated in the survey may have introduced changes in energy bills.

**Table 9: Changes Noticed in Energy Bills Since Installation**

| <b>Changes Noticed</b> | <b>2011</b> |
|------------------------|-------------|
| <i>Sample Size</i>     | <i>70</i>   |
| Bills have gone down   | 37%         |
| No change in bills     | 30          |
| Bills have gone up     | 11          |
| Too soon to tell       | 7           |
| Don't know             | 14          |

Participants were asked a series of questions to assess improvements that had occurred since participating in the program. Using a 5-point scale, where 1 meant no improvement experienced and 5 meant considerable improvement experienced, a small majority noted improvement. Specifically, judging from the combined percentage of participants who offered scores of 4 and 5, one-half noted an improvement in their own interest in energy efficiency (53%), in their personal knowledge of energy efficiency (53%) and in the comfort of their home (52%).

**Table 10: Improvements Since Participating in the LIR Program**

| <b>Improvements</b>            | <i>Sample Size</i> | <b>2011</b>                                                          |          |          |          |          |           |
|--------------------------------|--------------------|----------------------------------------------------------------------|----------|----------|----------|----------|-----------|
|                                |                    | <b>Rating: 5= "considerable improvement" and 1= "no improvement"</b> |          |          |          |          |           |
|                                |                    | <b>5</b>                                                             | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>DK</b> |
| Interest in energy efficiency  | 70                 | 30%                                                                  | 23       | 23       | 9        | 10       | 6         |
| Knowledge of energy efficiency | 70                 | 23%                                                                  | 30       | 24       | 4        | 13       | 6         |
| Comfort of the home            | 70                 | 26%                                                                  | 26       | 23       | 9        | 14       | 3         |

Participants report less ambiguity when asked about the specific impact of the products installed through the LIR program. Eight in 10 report having noticed improved indoor lighting (81%), while one-half indicate that the products have provided longer lasting hot water (53%). Another three in 10 have noticed fewer drafts throughout their home (29%).

This last result shows inconsistencies among respondents' answers since the program did not include any air sealing measures. As mentioned above, caution should be used in the interpretation of the survey results.

**Table 11: Impact of Products Installed Through the LIR Program**

| <b>Products with an Impact</b>                 | <b>2011</b> |
|------------------------------------------------|-------------|
| <i>Sample Size</i>                             | 70          |
| Improved indoor lighting                       | 81%         |
| Provided longer lasting hot water              | 53          |
| Led to noticeably fewer drafts throughout home | 29          |

### 3.6.4 Satisfaction with the Program

Most program participants are satisfied with the LIR program. Indeed, close to eight in 10 participants offered a rating of 5 or 4 on a 5-point scale (78% combined), where 5 is “very satisfied” and 1 “very dissatisfied,” when assessing their overall experience with the LIR program. Only a very small minority offered a score of 1 or 2 to express their dissatisfaction (5% combined), while just under two in 10 offered a mid-range score of 3 (16%).

**Table 12: Overall Experience with the LIR program**

| <b>Level of Satisfaction</b>                     | <b>2011</b> |
|--------------------------------------------------|-------------|
| <i>Sample Size**</i>                             | 69          |
| Very satisfied – 5                               | 55%         |
| 4                                                | 23          |
| 3                                                | 16          |
| 2                                                | 4           |
| Very dissatisfied – 1                            | 1           |
| **Don't know/no answer removed from calculations |             |

To further examine the reasons why participants were satisfied with the LIR program, those who expressed satisfaction by indicating a score of 4 or 5 were asked to state the single most important reason for their satisfaction with the program overall. A lower energy bill (28%) was identified as the single most important reason for program satisfaction, followed by good service (22%), saving energy (17%) as well as better lights/lighting and lights replacement, combined for 22%.

**Table 13: Satisfaction with the Program**

| <b>Reasons for Satisfaction</b>   | <b>2011*</b> |
|-----------------------------------|--------------|
| <i>Sample Size</i>                | <i>54</i>    |
| Lowered energy bill               | 28%          |
| Good service                      | 22           |
| Saves energy                      | 17           |
| Better lights/lighting            | 11           |
| Replaced the lights               | 11           |
| Explained the program/informative | 4            |
| Other                             | 11           |
| Nothing                           | 2            |
| Don't know                        | 6            |
| *Multiple responses               |              |

Similarly, respondents who indicated that they were neither satisfied nor dissatisfied with the program overall were asked about the reasons for their neutral impression of the program. From the few participants who comprise this group (n = 11), the top mentions referred to not liking the lamps received (4 respondents) and not seeing a power bill decrease (3 respondents). Additionally, one respondent expressed that more was expected of the program, although the small sample size warrants caution in the interpretation of these results.

**Table 14: Neutral Impression of the Program**

| <b>Reasons for Being Neutral</b>    | <b>2011* (#)</b> |
|-------------------------------------|------------------|
| <i>Sample Size</i>                  | <i>11</i>        |
| Don't like the light bulbs received | 4                |
| Bill did not decrease               | 3                |
| Expected more                       | 1                |
| Other                               | 2                |
| Don't know                          | 2                |
| *Multiple responses                 |                  |

The very few dissatisfied participants (n = 4) mainly attributed their dissatisfaction to an observation that their bill had not decreased.

**Table 15: Dissatisfaction with the Program**

| Reasons for Dissatisfaction | 2011 (#) |
|-----------------------------|----------|
| <i>Sample Size</i>          | 4        |
| Bill did not decrease       | 2        |
| Other                       | 2        |

Using a 5-point satisfaction scale, where 5 is “very satisfied” and 1 is “very dissatisfied,” participants were asked to rate various aspects of the program. Most aspects received high satisfaction ratings. Indeed, the vast majority of participants were very satisfied with the time required to complete the work (87%) and the quality of work completed (84%). Although slightly lower, satisfaction levels with the energy conservation products installed (69% very satisfied) and overall communication (66% very satisfied) are relatively healthy and include the vast majority of participants when examining those who gave ratings of 5 or 4. For all aspects, only a very small minority expressed dissatisfaction (scores of 1 or 2; 1%-6%).

**Table 16: Satisfaction with Aspects of the LIR Program**

| Satisfaction with Aspect of Program              | Sample Size** | 2011<br>Rating: 5= “very satisfied”<br>and 1= “very dissatisfied” |    |    |    |    |
|--------------------------------------------------|---------------|-------------------------------------------------------------------|----|----|----|----|
|                                                  |               | 5                                                                 | 4  | 3  | 2  | 1  |
| Time required to complete work                   | 69            | 87%                                                               | 4  | 7  | 1  | -- |
| Quality of work completed                        | 69            | 84%                                                               | 12 | 3  | 1  | -- |
| Energy-efficient products installed              | 64            | 69%                                                               | 27 | 5  | -- | -- |
| Overall communication                            | 62            | 66%                                                               | 18 | 10 | 2  | 4  |
| **Don't know/no answer removed from calculations |               |                                                                   |    |    |    |    |



### 3.6.5 Recommendations for Improvements

When asked whether they had any recommendations that would improve the program, the vast majority indicated that they did not (81%). The small minority who had recommendations suggested the provision of better, brighter light bulbs (7%), offering more products to be installed (6%) and offering more information on the products installed (3%).

**Table 17: Recommendations to Improve the LIR Program**

| <b>Recommendations</b>                           | <b>2011</b> |
|--------------------------------------------------|-------------|
| <i>Sample Size</i>                               | <i>70</i>   |
| Offer better/brighter light bulbs                | 7%          |
| Offer more products to be installed              | 6           |
| Offer more information on the products installed | 3           |
| Improve communication                            | 1           |
| Other                                            | 6           |
| No recommendations                               | 81          |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > unitary savings per product;
- > installation rate;
- > energy-to-demand ratio; and
- > interactive effects.

The impact evaluation is the result of two main activities: a review of unitary savings and on-site visits.

Since it is the first impact evaluation for this program, the gross energy savings evaluation is based on a review of the unitary savings used in the program tracking sheet. For each product, Econoler reviewed the source of data and the parameters used in the unitary savings calculations.

On-site visits were also conducted in order to validate product installation and ensure that there had been no removal. The results of this validation are used in the impact evaluation in order to estimate the installation rate for each category of products. Some technical information based on on-site observations and self-declaration, such as the power of lamps replaced, was also collected to validate the parameters used in the unitary savings calculations.

#### **4.1.1 On-Site Visit Sampling and Protocol**

##### **Sampling Methodology**

A total of 15 on-site visits were conducted under the 2011 evaluation of ENSC's LIR program. The sampling was carried out using the program tracking sheet which contained the list of participants and information about all products installed.

The Evaluator's analysis of the tracking sheet showed that several products had been installed in the same household. That is why it was decided to select sites randomly and, afterward, to ensure that all products had been covered in the sample. Only one limitation was used for the sampling. Econoler focused its selection on the region of Halifax and Dartmouth where most program installations took place.

## **On-Site Visit Protocol**

The on-site visits were conducted to validate the installation of the products in accordance with the data found in the tracking sheet and, when such was the case, to establish the percentage of products removed and the reason for removing them after installation. Moreover, product information was collected through on-site observations or homeowner interviews in order to validate the assumptions used to calculate the product unitary savings:

- > For lighting measures: power of lamps replaced.
- > For power bars with integrated timer: equipment plugged in and correct usage of the timer.
- > For faucet aerators: location of the units.
- > For pipe and tank insulation: source of energy for water heating.

The on-site visit protocol listing the information to be collected for each residence is presented in Appendix VII.

## **4.2 GROSS SAVINGS**

The quantities of products installed under the program are computed in the tracking sheet. For each product, ENSC uses a unitary savings estimation that is either based on past evaluation results or on other studies conducted by credible organizations. In some instances, the unitary savings estimations used by ENSC are based on a study conducted by Navigant Consulting, for which the assumptions used to estimate the savings were not available. In these cases, Econoler based its review on the 2011 Ontario Power Authority (OPA) Prescriptive Measures and Assumptions report<sup>3</sup> or on other reliable secondary sources of data. This document is a reliable secondary data source in which the assumptions used for savings calculations are well documented.

### **4.2.1 CFLs**

ENSC uses the same unitary savings value of 41 kWh for all CFLs installed under its residential programs. This assumption comes from an analysis conducted for the 2009 evaluation of the Low Income Homeowner program, which presented several studies indicating that 13 W CFLs show annual savings ranging from 29.6 kWh to 44.3 kWh, and recommended to continue using the 41 kWh savings assumption. This 2009 evaluation considered that 13 W CFLs usually replace 60 W incandescent bulbs; as a result, the time of operation used to calculate the 41 kWh savings assumption should be equal to 2.4 h/day. This, in turn, corresponds to the daily usage of interior

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<sup>3</sup> Ontario Power Authority (OPA), "2011 Prescriptive Measures and Assumptions," Release Version 1, March 2011.

fixtures estimated from the telephone survey conducted in 2010 under the Retail Markdown Program (RMP).

This value was revised by Econoler for two different categories. The program offers the installation of two types of CFLs: 13 watt and 23 watt CFLs. Since these two types of products are entered separately in the tracking sheet, Econoler elected to establish a different unitary savings value for each of them.

### 13 Watt CFLs

According to the ENERGY STAR light output equivalency table, a 13 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Thus, the replacement of a 60 watt incandescent lamp for a 13 watt CFL is considered the base case for this product and corresponds to a displaced wattage of 47 W.

As for all ENSC residential programs, the daily usage of 13 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program. The value used by ENSC (2.4 h/day) was estimated from participant declarations during a telephone survey. However, Econoler considers that the daily usage of 2.7 hours from Hydro-Québec's metering study<sup>4</sup> is more accurate. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behavior factors can influence the respondents' answers.

The review resulted in a unitary savings value for 13 watt CFLs of 46.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 13 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 46.3 \frac{\text{kWh}}{\text{yr}}$$

### 23 Watt CFLs

For estimating the unitary savings value for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the actual wattage of the CFLs (23 W) and the average wattage of the incandescent lamps typically replaced with such CFLs. Based on the data collected through the Efficient Products – Direct Install program for residential buildings, Econoler estimated that old incandescent lamps replaced with 23 watt CFLs have an average wattage of 93.5 W. This value is consistent to what is found on the market. In fact, according to the ENERGY STAR light output equivalency table, 23 watt CFLs are comparable to 75 or 100 watt incandescent

<sup>4</sup> Econoler, "Evaluation Report: Programme Produits Mieux Consommer – Éclairage résidentiel," presented to Hydro-Québec, Quebec, March 30, 2011.

lamps. However, incandescent lamps of 75 watts are rarely available on the market and manufacturers indicate more often that the light output of a 23 watt CFL is sufficient to replace a 100 watt incandescent lamp. Thus, Econoler considers adequate using an average replaced wattage of 93.5 W resulting in an average displaced wattage of 70.5 W.

As for 13 watt CFLs, the daily usage of 23 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

The review resulted in a unitary savings value for 23 watt CFLs of 69.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

Econoler expected to validate the adequacy of these unitary savings values by comparing the old incandescent lamp wattage assumptions used in the calculations with the old incandescent lamp wattage declared by participants during on-site visits. However, participants did not know the exact wattage of the old lamps replaced and could only declare that the majority were probably 60 watt incandescent lamps. This value corresponds to that used in the displaced wattage calculation for 13 watt CFLs and allows validating the unitary savings calculation for this product, which represents more than 70 percent of the CFLs installed through the program.

Nevertheless, the on-site visits did not allow Econoler to confirm that 23 watt CFLs had been used to replace old incandescent lamps with an equivalent light output. Since participants could not provide more precise information on replaced wattage, the best way to remedy this lack in the future evaluation would be to collect information on replaced wattage during the direct installation.

#### **4.2.2 CFL Compatible Floor Lamps (CFL Torchieres)**

The unitary savings for CFL compatible floor lamps, more specifically CFL torchieres, is estimated at 241 kWh, based on the Navigant study mentioned earlier. The assumptions used to estimate this value were not available. Thereby, Econoler based its review on other studies and assumptions.

The average displaced wattage was estimated by calculating the difference between the average wattage of CFL torchieres installed through the program and the average equivalent wattage of the replaced incandescent lamps, using ENERGY STAR's light output equivalency table. According to the DA's subcontractor, the CFL torchieres that are the most installed through the program have a power of 23 watts, which corresponds to an average equivalent power replaced of 93.5 watts. This analysis provides an average displaced wattage of 70.5 watts.

For the hours of operation, Econoler uses the same daily usage of 2.7 hours, as is the case with CFLs.

Using these assumptions, the annual unitary savings value for CFL torchieres is calculated based on the equation below.

$$\text{Annual Unitary Saving} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

Therefore, the unitary savings estimation of 241 kWh will be adjusted to the 69.5 kWh value calculated from the real data of the CFL torchieres installed through the LIR program.

### 4.2.3 LED Nightlights

Based on a technical reference manual from the Pennsylvania Public Utility Commission<sup>5</sup>, ENSC estimates a unitary savings value of 26 kWh for the installation of LED nightlights. The assumptions behind this savings calculation are presented in the table below.

**Table 18: Unitary Savings Estimation for LED Nightlights**

| Parameters                            | Values        |
|---------------------------------------|---------------|
| Old Wattage (incandescent nightlight) | 7 W           |
| New Wattage (LED nightlight)          | 1 W           |
| Average Displaced Wattage             | 6 W           |
| Operating Time                        | 12 h/day      |
| <b>Annual Savings</b>                 | <b>26 kWh</b> |

LED nightlights installed under the program have a wattage value of 0.3 W. They are used to replace old nightlights which are traditionally made of a 7 W incandescent light. Such replacement results in an average displaced wattage of 6.7 W, which will be used by Econoler for this evaluation.

The 12-hour/day operation time used by the Pennsylvania Public Utility Commission represents a nightlight that is turned on all night. Econoler could not find any other jurisdiction to support this value. However, the Evaluator considers that the 12-hour value is adequate. The LED nightlights installed through the program are equipped with a sensor that automatically turns on the nightlight when it is dark. Therefore, the nightlights installed in rooms that are not affected by daylight are likely to remain

<sup>5</sup> Pennsylvania Public Utility Commission, "Technical Reference Manual," Pennsylvania, June 2011.

on for several hours during the day. For nightlights installed in rooms affected by daylight, there is a potential operating time of 11.8 hours per day since the average time of illumination in Halifax is 12.2 hours per day<sup>6</sup>. Another element justifying the operating time of 12 hours lies in the fact that on-site visits results provide for an average usage of 11.8 hours a day, based on participant declarations.

Using a displaced wattage of 6.7 W and an average operating time of 12 hours a day, Econoler calculated a unitary savings value of 29.3 kWh. This value will be used in the gross savings calculations for the installation of LED nightlights.

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<sup>6</sup> National Research Council Canada, Sunrise/Sunset Calculator, Standard times of solar rise for Halifax, Nova Scotia, 2011, [www.nrc-cnrc.gc.ca](http://www.nrc-cnrc.gc.ca).

#### 4.2.4 Seasonal LED Lights

ENSC offers seasonal LED lights to LIR program participants. The unitary savings estimate for this product is 17.52 kWh per set of lamps. This value is based on ENSC's estimates for the LED Holiday Lighting Exchange program and on the real wattage value of the LED light sets offered through the LIR program.

**Table 19: ENSC Unitary Savings Estimate for Seasonal LED Lights**

| Parameters                                                      | Values                                                                                                     |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Proportion of old large incandescent sets<br>(25 lamps per set) | 40%                                                                                                        |
| Proportion of old mini incandescent sets<br>(100 lamps per set) | 40%                                                                                                        |
| Proportion of old mini incandescent sets<br>(50 lamps per set)  | 20%                                                                                                        |
| Wattage of old large incandescent sets<br>(25 lamps per set)    | $7 \text{ W/lamp} \times 25 \text{ lamps/set} = 175 \text{ W/set}$                                         |
| Wattage of old mini incandescent sets<br>(100 lamps per set)    | $0.4 \text{ W/lamp} \times 100 \text{ lamps/set} = 40 \text{ W/set}$                                       |
| Wattage of old mini incandescent sets<br>(50 lamps per set)     | $0.4 \text{ W/lamp} \times 500 \text{ lamps/set} = 20 \text{ W/set}$                                       |
| Average old wattage (incandescent sets)                         | $(40\% \times 175 \text{ W}) + (40\% \times 40 \text{ W}) + (20\% \times 20 \text{ W}) = 90 \text{ W/set}$ |
| Wattage of new LED sets<br>(35 lamps per set)                   | $0.069 \text{ W/lamp} \times 35 \text{ lamps/set} = 2.4 \text{ W}$                                         |
| Average displaced wattage                                       | $(90 \text{ W} - 2.4 \text{ W}) = 87.6 \text{ W}$                                                          |
| Annual usage                                                    | $5 \text{ h/day} \times 40 \text{ days/yr} = 200 \text{ h/yr}$                                             |
| <b>Annual Savings</b>                                           | <b><math>87.6 \text{ W} \times 200 \text{ h/yr} = 17.52 \text{ kWh}</math></b>                             |

Econoler reviewed this savings estimate. The proportions of each type of old sets returned are based on in-field observation from the LED Holiday Lighting Exchange program. The wattages used for these three different types of old sets returned were validated by reviewing the different studies presented in the next table.



**Table 20: Wattage Values for Holiday Incandescent Lights**

| Type of Lights     | Estimated Wattage | Source                                                   |
|--------------------|-------------------|----------------------------------------------------------|
| Large incandescent | 7.00 W            | Based on results from testing done by PG&E <sup>7</sup>  |
| Mini incandescent  | 0.45 W            |                                                          |
| Large incandescent | 7 and 5 W         | BC Hydro, Impact Evaluation – Seasonal LEDs <sup>8</sup> |
| Mini incandescent  | 0.40 W            |                                                          |
| Large incandescent | 5 W               | Ontario Power Authority Report <sup>9</sup>              |
| Mini incandescent  | 0.5 W             |                                                          |

These studies demonstrate that the wattage values used by ENSC for large and mini incandescent light sets are appropriate. Thus, no adjustment is needed.

The wattage used for the replacement set of LED lights provided by ENSC corresponds to the real wattage value of the set of 35 C-6 LED lights offered through the program.

For the hours of operation, Econoler found acceptable the annual usage of 40 days used by ENSC. While BC Hydro<sup>10</sup> and the OPA rather contemplate an annual usage of 31 days, corresponding to the entire month of December, other jurisdictions like the U.S. Department of Energy<sup>11</sup>, PG&E<sup>12</sup> and the University of Maine<sup>13</sup> consider an annual usage of 40 to 45 days to estimate the savings associated with the usage of LED holiday lighting. Moreover, most of these jurisdictions have agreed to a daily usage of five hours. Therefore, Econoler decided to use ENSC's assumption of 40 days per year coupled with a daily usage of five hours, which represents an average value of all the studies mentioned above.

Econoler's review determined that the assumptions used by ENSC to estimate the unitary savings value for the seasonal LED lights distributed through the program are reasonable. As a result, the unitary savings value of 17.52 kWh was used in the evaluation to compute the gross energy savings achieved with seasonal LED lights.

<sup>7</sup> Pacific Gas and Electric Company (PG&E), A Better Way to Light Up the Holidays, [www.pge.com](http://www.pge.com), 2012.

<sup>8</sup> Sampson Research, Market & Impact Evaluation of BC Hydro's Seasonal LED Initiative, Executive Summary prepared for BC Hydro, July 28, 2005.

<sup>9</sup> Ontario Power Authority (OPA), "2010 Prescriptive Measures and Assumptions" and "2011 Prescriptive Measures and Assumptions," [www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists](http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists).

<sup>10</sup> BC Hydro, Make your Holiday Season Bright and Energy Efficient!, Power Smart program, [www.bchydro.com](http://www.bchydro.com), October 2010.

<sup>11</sup> U.S. Department of Energy, LED Products, Energy Savers, [www.energysavers.gov](http://www.energysavers.gov), Last Update: 2012-01-11.

<sup>12</sup> PG&E, A better Way to Light Up the Holidays, [www.pge.com](http://www.pge.com).

<sup>13</sup> The University of Maine, LED Alternatives Offer Efficient Holiday Lighting, [www.umaine.edu](http://www.umaine.edu), November 29, 2010.

#### 4.2.5 Faucet Aerators

The unitary savings value for faucet aerators is estimated to be 86 kWh, based on the Navigant study. However, the assumptions used to estimate this value are not available, so Econoler relied on other studies and assumptions to conduct its evaluation.

To calculate the unitary savings value, Econoler reviewed two studies estimating the annual value for the installation of faucet aerators.

**Table 21: Unitary Savings Estimate for Faucet Aerators from Other Jurisdictions**

| Annual Unitary Savings | Source                                             |
|------------------------|----------------------------------------------------|
| 176.30 kWh             | OPA                                                |
| 159.1 kWh              | Wisconsin Focus on Energy Evaluation <sup>14</sup> |

The annual unitary savings value presented in the table above is an average savings value per faucet, calculated from three faucets, one installed in the kitchen and two in the bathrooms. The on-site visit results revealed that, in most cases, faucet aerators are installed in one kitchen and one bathroom for the same house. Since the savings are higher for faucet aerators installed in kitchens as opposed to bathrooms, the assumption used to establish an average value is conservative.

Both studies used a base flow rate of 2.2 gpm reduced by 31.8 percent to 1.5 gpm, which is adequate. The narrow gap between both values is primarily due to a difference between the average hot water usage assumptions. Econoler used the OPA unitary savings since a comparison with a Canadian province is more appropriate and because many unitary savings from the OPA are already deemed acceptable for most products promoted through ENSC programs. Therefore, the unitary savings value that is used in the current evaluation is 176.30 kWh per year.

#### 4.2.6 Low-Flow Showerheads

For low-flow showerheads, ENSC uses a unitary savings value of 157 kWh. This savings value is based on the Navigant study for which the calculation details were not available. Therefore, Econoler had to rely on other sources of data to review the unitary savings generated by the installation of low-flow showerheads. In the OPA report, the annual savings for low-flow showerheads are calculated using the assumptions below.

<sup>14</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.

**Table 22: OPA Unitary Savings Estimate for Low-Flow Showerheads**

| Parameters                                  | Values                       |
|---------------------------------------------|------------------------------|
| Typical Flow Rate for a Low-Flow Showerhead | 4.73 L/min (1.25 gpm)        |
| Average Flow Rate for a Regular Showerhead  | 7.57 L/min (2.0 gpm)         |
| Average Number of Showers Taken             | 2.3 showers/day/household    |
| Average Showering Time                      | 7.5 minutes                  |
| Average Shower Temperature                  | 40°C (104°F)                 |
| <b>Annual Savings</b>                       | <b>377 kWh per household</b> |

Econoler considers these parameters reliable and conservative. On its website, Natural Resources Canada (NRCAN) promotes the installation of low-flow showerheads<sup>15</sup>. NRCAN specifies that these showerheads range from as low as 3.8 litres per minute to 9.5 litres per minute, with the most common around five litres per minute. This value is close to that used by the OPA in its assumption for a typical low-flow showerhead rate. Using its assumptions, NRCAN calculates an annual savings value of 377 kWh per household, similar to the OPA's.

Finally, since the average number of showerheads installed through the program is equal to 1.01 units per household, Econoler concludes that the annual savings value of 377 kWh can be used as a unitary savings value per low-flow showerhead.

#### 4.2.7 Power Bars with Integrated Timer

Based on the OPA report, ENSC uses a unitary savings value of 53 kWh for the installation of power bars with integrated timer. This product helps reduce the standby power of the electronic devices plugged into it. The OPA calculates the annual savings for this product using a weighted average of the savings generated for each group of electric devices that can be plugged into a power bar.

<sup>15</sup> Natural Resources Canada, Personal: Residential – Better Water Use Means Bigger Savings, [www.oeo.nrcan.gc.ca](http://www.oeo.nrcan.gc.ca).

**Table 23: OPA Unitary Savings Estimate for Power Bars with Integrated Timer**

| Parameters                      | Entertainment Centres | Computer Systems | Lighting   | Others     |
|---------------------------------|-----------------------|------------------|------------|------------|
| Proportion                      | 40.3%                 | 15.7%            | 19.4%      | 24.6%      |
| Average wattage                 | 38.1 W                | 28 W             | 60 W       | 28 W       |
| Old operating time              | 9 h/day               | 14 h/day         | 6 h/day    | 11 h/day   |
| New operating time – with timer | 5 h/day               | 8 h/day          | 3 h/day    | 4 h/day    |
| Operating season                | 12 months             | 12 months        | 8.5 months | 8.6 months |
| <b>Annual Savings</b>           | <b>53.09 kWh</b>      |                  |            |            |

Econoler considers these assumptions acceptable. The on-site visits revealed that the power bars with integrated timer are mainly installed on entertainment centre devices, which confirms the proportion of 40 percent used for this electronic device. Therefore, Econoler has continued using the unitary savings value of 53 kWh per year for the power bars with integrated timer installed through the LIR program. This unitary savings value is also used in the ENSC Retail Markdown Program and the Efficient Products – Multi-Unit Residential Renter program.

#### 4.2.8 Pipe Insulation

The LIR program proposes the installation of water heater pipe insulation for renters where the domestic hot water is heated electrically. For this product, ENSC uses a unitary savings value of 74 kWh per year per 10-feet of insulated pipe, based on the 2009 impact evaluation report of the Low Income Homeowner program. Initially, the annual savings value used by ENSC assumed that pipe insulation was installed on a 1.5-inch pipe. In 2009, the evaluation revised the savings value to use a 0.75-inch pipe, which was considered as more common in residential applications. Econoler maintained this unitary savings value of 74 kWh per year since it is consistent with the insulated pipe size found in the OPA report.

#### 4.2.9 Hot Water Tank Wraps

The low-income tenants participating in the program can also benefit from the installation of hot water tank wraps for electric domestic hot water heaters. For this product, ENSC uses a unitary savings value of 399 kWh per year. This savings value is based on the 2009 impact evaluation report of the Low Income Homeowner program.

As a second source, Econoler consulted the OPA report. In the 2011 version, the installation of water heater blankets in the residential market was analyzed.

The annual unitary savings for both single- and multi-family households were estimated at 270 kWh. Since the assumptions used by the OPA to estimate this unitary savings value are clear, well documented and reliable, Econoler used the unitary savings value of 270 kWh per year for this evaluation.

#### 4.2.10 Installation Rate

The LIR program proposes direct installation of various products. For various reasons, it is possible for a participant to decide to remove a product after its installation. The on-site visits were used to verify the phenomenon of product removal and, when significant, estimate an installation rate for the product concerned.

For each site, the number of products installed was validated on site and compared to the number indicated in the program tracking sheet. When the number of products found on site was different from the number in the tracking sheet, the ratio between both numbers was calculated to establish the percentage of products installed. The percentage of products installed was measured for all products installed through the program, except for seasonal LED lights. For power bars with integrated timer, the percentage of products installed was measured by verifying that the end-users were using the timer. This timer is specific to an energy-efficient power bar, and not using it prevents the reduction of standby power and thus the achievement of savings.

The table below shows the percentages of products installed calculated from the on-site visits and the installation rates applied to the quantity of products installed in the gross savings calculation. The 15 on-site visits were scheduled mainly for quality assurance. Therefore, for some categories of products, the precision level was too low for establishing an installation rate to apply to all the products installed through the program. As a result, an installation rate of 100 percent was used for these categories.

**Table 24: Percentage of Products Installed and Installation Rate**

| Category of Products    | Tracking Sheet – Number Installed | On-Site Visits – Number Installed | Percentage of Products Installed | Installation Rate used in Gross Savings Calculation |
|-------------------------|-----------------------------------|-----------------------------------|----------------------------------|-----------------------------------------------------|
| CFLs and CFL torchieres | 125                               | 123                               | 98.4%                            | 100%                                                |
| LED nightlights         | 32                                | 20                                | 62.5%                            | 100%                                                |
| Faucet aerators         | 9                                 | 4                                 | 44.4%                            | 100%                                                |
| Low-flow showerheads    | 4                                 | 4                                 | 100%                             | 100%                                                |
| Power bars with timer   | 7                                 | 0                                 | 0%                               | 0%                                                  |
| Pipe insulation         | 3                                 | 3                                 | 100%                             | 100%                                                |

|                      |   |   |      |      |
|----------------------|---|---|------|------|
| Hot water tank wraps | 3 | 3 | 100% | 100% |
|----------------------|---|---|------|------|

In only one site, the Evaluator observed that a few CFLs had been removed. Since it seemed to be a localized phenomenon, the Evaluator used an installation of 100 percent for this product. This result was confirmed during the telephone survey. Only one participant out of 70 revealed having removed one of their CFLs after their installation by the program.

A significant level of removal was found for faucet aerators and LED nightlights. However, the precision level was not sufficient to establish an installation rate to apply to all the LED nightlights and faucet aerators installed through the program. For LED nightlights, several participants declared that they had removed one or all of their nightlights because they did not need them. This is something that should be validated by the installer before offering a product. Moreover, since a significant level of removal was found for those two products, Econoler recommends increasing the number of on-site visits for the next evaluation. The number of on-site visits should be sufficient to establish an installation rate with a reasonable margin error, at least for CFLs, LED nightlights and faucet aerators.

For power bars, the on-site visits revealed that the timer was not used by participants. Six sites visited had received one or two power bars with integrated timer through the program. Among them, two sites had removed the product. Additionally, among others, none used the timer, often explaining that they did not remember how to use it. As a result, the installation rate used for power bars with integrated timer is estimated at 0 percent, which means that no savings is computed for this product. This issue could be addressed in the future by ensuring that participants have received all the necessary information to use the timer and that they understand the necessity of using it to achieve the desired energy savings.

In a few cases (low-flow showerheads, pipe insulation and hot water tank wraps), the total quantity of products installed in the 15 sites visited was small as they depended on the energy source used for water heating. However, the results showed that there did not seem to be a removal problem for these products. Econoler concluded to use an installation rate of 100 percent for these products.

Finally, for seasonal LED lights, the installation rate is estimated at 100 percent.

#### **4.2.11 Energy-to-Demand Ratio**

Econoler calculated the demand savings for the LIR program based on an energy-to-demand ratio of 4.46 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings by the target peak demand savings.

#### **4.2.12 Revised Gross Savings**

The annual gross savings for each category of products installed through the LIR program are presented in Table 25. They were calculated using the revised unitary savings established in the previous section. Overall, the total gross energy and demand savings amount to 4.973 GWh and 1.115 MW at the meter.

The gross savings at generator level are also estimated in Table 25, using a line loss factor between the meter and the generator of 1.1043 (provided by NSPI). They correspond to energy and demand savings of 5.492 GWh and 1.231 MW.

**Table 25: Evaluation Results – Gross Energy and Demand Savings by Product**

| Product Category                                       | 13 Watt CFLs | 23 Watt CFLs | CFL Torchieres | LED Nightlights | Seasonal LED lights | Faucet Aerators | Low-Flow Shower-heads | Power Bars with Timer | Pipe Insulation | Hot Water Tank Wraps |
|--------------------------------------------------------|--------------|--------------|----------------|-----------------|---------------------|-----------------|-----------------------|-----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                  |              |              |                |                 |                     |                 |                       |                       |                 |                      |
| Number of units – from tracking sheet                  | 49,563       | 12,482       | 229            | 7,604           | 140                 | 3,470           | 1,446                 | 981                   | 1,868           | 1,018                |
| Installation rate                                      | 100%         | 100%         | 100%           | 100%            | 100%                | 100%            | 100%                  | 0%                    | 100%            | 100%                 |
| Total number of units installed                        | 49,563       | 12,482       | 229            | 7,604           | 140                 | 3,470           | 1,446                 | 0                     | 1,868           | 1,018                |
| Unitary savings value (kWh)                            | 46.3         | 69.5         | 69.5           | 29.3            | 17.52               | 176.3           | 377                   | 53                    | 74              | 270                  |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>2.295</b> | <b>0.867</b> | <b>0.016</b>   | <b>0.223</b>    | <b>0.002</b>        | <b>0.612</b>    | <b>0.545</b>          | <b>0</b>              | <b>0.138</b>    | <b>0.275</b>         |
| Line loss factor                                       | 1.1043       | 1.1043       | 1.1043         | 1.1043          | 1.1043              | 1.1043          | 1.1043                | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>2.534</b> | <b>0.958</b> | <b>0.018</b>   | <b>0.246</b>    | <b>0.003</b>        | <b>0.676</b>    | <b>0.602</b>          | <b>0</b>              | <b>0.153</b>    | <b>0.304</b>         |
| <b>Demand Savings</b>                                  |              |              |                |                 |                     |                 |                       |                       |                 |                      |
| Energy-to-demand ratio                                 | 4.46         | 4.46         | 4.46           | 4.46            | 4.46                | 4.46            | 4.46                  | 4.46                  | 4.46            | 4.46                 |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.515</b> | <b>0.195</b> | <b>0.004</b>   | <b>0.050</b>    | <b>0.001</b>        | <b>0.137</b>    | <b>0.122</b>          | <b>0</b>              | <b>0.031</b>    | <b>0.062</b>         |
| Line loss factor                                       | 1.1043       | 1.1043       | 1.1043         | 1.1043          | 1.1043              | 1.1043          | 1.1043                | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.568</b> | <b>0.215</b> | <b>0.004</b>   | <b>0.055</b>    | <b>0.001</b>        | <b>0.151</b>    | <b>0.135</b>          | <b>0</b>              | <b>0.034</b>    | <b>0.068</b>         |



## **4.3 INTERACTIVE EFFECTS**

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the LIR program, replacement of lighting products with CFLs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, a CFL releases less heat than the less efficient lamp it replaces.

For CFLs, CFL torchieres and LED nightlights, an interactive effects factor of -16.2 percent is used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work carried out in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2 software<sup>16</sup> and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high interactive effects. The scenario with minimum interactive effects was finally selected for the calculation because it accounted for the evolution of homes since 1992.

The table below presents the calculation details of the interactive effects factor for CFLs, CFL torchieres and LED nightlights. It reflects the proportion of low-income renter customers in Nova Scotia who are heated electrically and the proportion of residences that use air conditioning. In fact, the share of low-income renter customers who are heated electrically (29%) was provided by the program's DA. However, they had not compiled any information on air conditioning. As a result, Econoler used the percentage of households using air conditioning in Nova Scotia (18%)<sup>17</sup>. This value was used since no information specific to the low-income renter market was available. For the next evaluation, Econoler recommends collecting and compiling such information.

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<sup>16</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>17</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

**Table 26: Interactive Effects Factor for CFLs, CFL Torchieres and LED Nightlights**

| Parameters                                   | % of Residences <sup>18</sup> | Interactive Effects <sup>19</sup> |
|----------------------------------------------|-------------------------------|-----------------------------------|
| Electric heating with air conditioning       | $29\% \times 18\% = 5.2\%$    | -54.4%                            |
| Electric heating without air conditioning    | $29\% \times 82\% = 23.8\%$   | -58.0%                            |
| No electric heating with air conditioning    | $71\% \times 18\% = 12.8\%$   | 3.6%                              |
| No electric heating without air conditioning | $71\% \times 82\% = 58.2\%$   | 0%                                |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                   | <b>-16.2%</b>                     |

For seasonal LED lights, the interactive effects factor is estimated at -100 percent for indoor installation in electrically heated houses. This assumption is based on the fact that holiday decorative lighting is installed during winter (heating season), in common rooms, at medium-high and when no air conditioning unit is used. Therefore, 100 percent of the energy released from the holiday light bulbs is used for the heating load. Similar discussions were held a few years ago with Hydro-Québec for its holiday lighting program and it was agreed to remove any impact for electrically heated houses. Only external holiday lighting was promoted and considered for the energy savings. The table below presents the calculation details of the interactive effects factor for seasonal LED lights. It reflects the proportion of low-income renter customers in Nova Scotia who use electricity as a main heating source and the percentage of residences where seasonal LED lights were installed inside the house. To determine the indoor/outdoor installation ratio, Econoler used the proportions of each type of old sets returned through the LED Holiday Lighting Exchange program and assumed that the sets of LED lights used as replacement for large incandescent lights had been installed outside. Those sets represented 40 percent of the sets handed out. The remaining sets, replacing mini incandescent lights, were considered to be used for indoor holiday decoration. Since the seasonal LED lights were not necessarily offered during the holiday season, it was not possible to determine whether participants would install the lights inside or outside. Therefore, Econoler used the most reliable data available for the calculation of the interactive effects.

<sup>18</sup> From DA information and Statistics Canada.

<sup>19</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

**Table 27: Interactive Effects Factor for Seasonal LED Lights**

| Parameters                                               | % of Residences <sup>20</sup> | Interactive Effects |
|----------------------------------------------------------|-------------------------------|---------------------|
| Using electric heating – Indoor seasonal LED lights      | $29\% \times 60\% = 17.4\%$   | -100%               |
| Using electric heating – Outdoor seasonal LED lights     | $29\% \times 40\% = 1.6\%$    | 0%                  |
| Not using electric heating – Indoor seasonal LED lights  | $71\% \times 60\% = 42.6\%$   | 0%                  |
| Not using electric heating – Outdoor seasonal LED lights | $71\% \times 40\% = 28.4\%$   | 0%                  |
| <b>Weighted Interactive Effects Factor</b>               | <b>100%</b>                   | <b>-17.4%</b>       |

For pipe insulation and hot water tank wraps, interactive effects of -100 percent are considered during the heating period in electrically heated houses. This estimation is based on the fact that, when there is no insulation, all the heat lost through the pipes and the hot water tank is released into the room. It means that 100 percent of the energy released from the hot water is used for the heating load. Conversely, during the cooling period, interactive effects are estimated at +100 percent in houses that use air conditioning. Based on the heating and cooling degree-days for the region of Halifax<sup>21</sup>, Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation. The table below presents the details for such calculation. As for lighting products, the table shows the proportion of low-income renter customers in Nova Scotia who are heated electrically and the proportion of residences that use air conditioning in Nova Scotia, which resulted in a weighted interactive effects factor of -16.3 percent.

**Table 28: Interactive Effects Factor for Pipe Insulation and Hot Water Tank Wraps**

| Parameters                                   | % of Residences <sup>22</sup> | Interactive Effects During Heating Period | Interactive Effects During Cooling Period |
|----------------------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------|
| Electric heating with air conditioning       | $29\% \times 18\% = 5.2\%$    | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric heating without air conditioning    | $29\% \times 82\% = 23.8\%$   | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| No electric heating with air conditioning    | $71\% \times 18\% = 12.8\%$   | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No electric heating without air conditioning | $71\% \times 82\% = 58.2\%$   | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                   | <b>-19.4%</b>                             | <b>+3.1%</b>                              |
|                                              |                               | <b>-16.3%</b>                             |                                           |

Finally, for all other products, interactive effects are considered as negligible.

<sup>20</sup> From DA information and Statistics Canada.

<sup>21</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.

<sup>22</sup> From DA information and Statistics Canada.

#### **4.4 NET-TO-GROSS RATIO**

The LIR program offers free direct installation of energy-efficient products to low-income renters. Due to the nature of the products offered and the target customers, the distortion effects of the program are assumed to be insignificant. Consequently, the net-to-gross ratio (NTGR) for this program is assumed to be 1.

#### **4.5 NET SAVINGS**

Since the NTGR for the program is assumed to be 1, the net savings were calculated only using the interactive effects estimated for each product category.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive effects})$$

In the case of the LIR program, the net energy savings were first calculated separately for each product because the interactive effects differed from one product to another. Table 29 presents the details of the calculation.

Overall, the total net energy and demand savings amount to 4.335 GWh and 0.976 MW at the meter, and 4.809 GWh and 1.078 MW at the generator.

**Table 29: Evaluation Results –Net Energy and Demand Savings by Product**

| Product Category                                     | 13 Watt CFLs | 23 Watt CFLs  | CFL Torchieres | LED Nightlights | Seasonal LED Lights | Faucet Aerators | Low-Flow Shower-heads | Power Bars with Timer | Pipe Insulation | Hot Water Tank Wraps |
|------------------------------------------------------|--------------|---------------|----------------|-----------------|---------------------|-----------------|-----------------------|-----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                |              |               |                |                 |                     |                 |                       |                       |                 |                      |
| Total gross energy savings – at meter (MWh)          | 2.295        | 0.867         | 0.016          | 0.223           | 0.002               | 0.612           | 0.545                 | 0                     | 0.138           | 0.275                |
| Interactive effects factor                           | -16.2%       | -16.2%        | -16.2%         | -16.2%          | -17.4%              | 0%              | 0%                    | 0%                    | -16.3%          | -16.3%               |
| NTGR                                                 | 1.00         | 1.00          | 1.00           | 1.00            | 1.00                | 1.00            | 1.00                  | 1.00                  | 1.00            | 1.00                 |
| <b>Total Net Energy Savings (GWh) – at Meter</b>     | <b>1.923</b> | <b>0.727</b>  | <b>0.013</b>   | <b>0.187</b>    | <b>0.002</b>        | <b>0.612</b>    | <b>0.545</b>          | <b>0</b>              | <b>0.116</b>    | <b>0.230</b>         |
| Line loss factor                                     | 1.1043       | 1.1043        | 1.1043         | 1.1043          | 1.1043              | 1.1043          | 1.1043                | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Net Energy Savings (GWh) – at Generator</b> | <b>2.124</b> | <b>0.8013</b> | <b>0.015</b>   | <b>0.206</b>    | <b>0.002</b>        | <b>0.676</b>    | <b>0.602</b>          | <b>0</b>              | <b>0.128</b>    | <b>0.254</b>         |
| <b>Demand Savings</b>                                |              |               |                |                 |                     |                 |                       |                       |                 |                      |
| Total gross demand savings – at meter (MWh)          | 0.515        | 0.195         | 0.004          | 0.050           | 0.001               | 0.137           | 0.122                 | 0                     | 0.031           | 0.062                |
| Interactive effects factor                           | -16.2%       | -16.2%        | -16.2%         | -16.2%          | -17.4%              | 0%              | 0%                    | 0%                    | -16.3%          | -16.3%               |
| NTGR                                                 | 1.00         | 1.00          | 1.00           | 1.00            | 1.00                | 1.00            | 1.00                  | 1.00                  | 1.00            | 1.00                 |
| <b>Total Net Demand Savings (MW) – at Meter</b>      | <b>0.431</b> | <b>0.163</b>  | <b>0.003</b>   | <b>0.042</b>    | <b>0.001</b>        | <b>0.137</b>    | <b>0.122</b>          | <b>0</b>              | <b>0.026</b>    | <b>0.052</b>         |
| Line loss factor                                     | 1.1043       | 1.1043        | 1.1043         | 1.1043          | 1.1043              | 1.1043          | 1.1043                | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Net Demand Savings (MW) – at Generator</b>  | <b>0.476</b> | <b>0.180</b>  | <b>0.003</b>   | <b>0.046</b>    | <b>0.001</b>        | <b>0.151</b>    | <b>0.135</b>          | <b>0</b>              | <b>0.029</b>    | <b>0.057</b>         |

The energy and demand savings resulting from this evaluation were compared to the energy and demand savings from the 2011 tracking sheet in the table below.

**Table 30: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 5.156 GWh             | 5.156 GWh               | 5.156 GWh                                        | 1.00        | 5.156 GWh        |
| <b>Evaluation Results</b> | <b>5.550 GWh</b>      | <b>5.492 GWh</b>        | <b>4.809 GWh</b>                                 | <b>1.00</b> | <b>4.809 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 1.156 MW              | 1.156 MW                | 1.156 MW                                         | 1.00        | 1.156 MW         |
| <b>Evaluation Results</b> | <b>1.244 MW</b>       | <b>1.231 MW</b>         | <b>1.078 MW</b>                                  | <b>1.00</b> | <b>1.078 MW</b>  |

The fact that the energy and demand savings fell short of those tracked by ENSC by 7 percent can be explained by the following factors:

- > Revision of the unitary savings values: For CFLs, LED nightlights, faucet aerators and low-flow showerheads, the unitary savings values were revised upward. On the other hand, in the case of CFL torchieres and hot water tank wraps, the unitary savings values were revised downward. The unitary savings values remained unchanged for seasonal LED lights, power bars with integrated timer and pipe insulation.
- > Addition of an installation rate: On-site visits revealed a removal phenomenon for CFLs, LED nightlights and faucet aerators. However, since the level of precision was not sufficient to calculate an installation rate, no adjustment was applied to the number of products installed in these categories. For power bars with integrated timer, the approach was somewhat different. The Evaluator wished to verify whether the timer had been used on the product and the on-site visits revealed that it was not the case. Therefore, an installation rate of 0 percent was used for this product. Since power bars with integrated timer are not one of the major products in the program, the impact of the installation rate remains small, with a difference of 0.051 GWh in terms of gross energy savings.
- > Interactive effects factor: Interactive effects were not taken into account in the tracking sheet. However, Econoler considers that the interactive effects on the heating and cooling loads caused by lighting product replacements, pipe insulation and hot water tank wraps are not negligible. Interactive effects factors were estimated for these products and used in the net savings calculations.

- > Line loss factor: In the tracking sheet, ENSC used a line loss factor of 1.1188, as in the 2010 evaluations for residential programs. The line loss factor for the residential sector was updated this year to 1.1043.

The addition of an installation rate for power bars with integrated timer and interactive effects factors allowed for a more precise estimation of program energy and demand savings. Despite these adjustments, which reduced program savings, the evaluation revealed important savings considering that the program was operating for its first year.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Document important program practices:</b> <ul style="list-style-type: none"> <li>– The disposal of old products should be documented in the program manual to have a complete description of the implementation process.</li> <li>– There are no instructions related to the source of energy used for space heating and water heating when installing hot water tank wraps. This information should be mentioned in the program manual to avoid any errors. Similarly, the program manual should also mention the guidelines for the installation of lighting products and the fact that it should be replacing a less efficient lamp.</li> </ul>                                                                                                                                                  |
|                               | <b>2. Provide a “base case”:</b> The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and update purposes.                                                                                                                                                                                                                                                                                                                                                              |
|                               | <b>3. Provide the parameters used to estimate program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |
|                               | <b>4. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but some important information is missing that would allow it to serve as the “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.                                                                                                                                                                                                                                                                                                                                                                  |



|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b>            | <p><b>5. Collect additional information on the products installed:</b> The PM, together with the evaluator, should determine what fields are necessary for administration and evaluation purposes and ensure the information is systematically entered for these fields. There are two fields in the tracking sheet that are not filled: the percentage of electric space heating and the hot water heating type. These two fields could be useful for the impact evaluation, more specifically for estimating interactive effects, and should be added to the data gathering protocol. In addition, information on the use of air conditioning units or system, which would allow a more precise estimation of interactive effects factors, should also be added to the data gathering protocol. In the case of lighting products, another element that could be relevant to have is the type, power and number of old lamps. This information could be used for validating the baseline case and for ensuring that the new lamps installed actually replaced less efficient lamps.</p> <p><b>6. Ensure that all customer information is filled in systematically:</b> Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. A protocol could be implemented to ensure that all information is collected and entered in the tracking sheet. There were a few entries missing in the customer tracking sheet, such as customer names, postal codes and phone numbers. This information is essential for conducting evaluation activities such as customer surveys and on-site visits. In the future, ENSC should ensure that these fields are filled in for all customers.</p> |
| <b>Program Design and Implementation</b> | <p><b>7. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PA are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> <p><b>8. Keep the program name consistent:</b> The Evaluator has noticed that program documentation carries two different names: Low Income Direct Install, which was the original name in the initial proposal and Low Income Renter, which is the formal program name. For evaluation purposes, and to avoid confusion in the market, the Evaluator recommends keeping the same program name in program documentation and ensuring that all program partners use the formal program name.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relationship with Partners</b> | <b>9. Monitor program barriers:</b> Program barriers should be frequently monitored to adjust the program components or the marketing strategy and ensure that the barriers are addressed. For example, if the perceived health risk becomes a more important barrier, ENSC could provide a brochure to better inform the participants about the technologies installed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Participant Perspectives</b>   | <b>10. Improve measure sustainability:</b> To maintain the sustainability of the products installed, the Evaluator recommends giving more information to participants about the features and benefits of the products. Furthermore, benefits other than financial should be mentioned in order to convince all tenants of the advantages of the products, even those who do not pay for their electricity bill or pay only a portion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Impact Evaluation</b>          | <b>11. Collect information on replaced wattage during the direct installation:</b> Econoler <b>expected</b> to validate the adequacy of these unitary savings values by comparing the old incandescent lamp wattage assumptions used in the calculations with the old incandescent lamp wattage declared by participants during on-site visits. However, participants did not know the exact wattage of the old lamps replaced and could only declare that the majority were probably 60 watt incandescent lamps. This value corresponds to that used in the displaced wattage calculation for 13 watt CFLs and allows validating the unitary savings calculation for this product, which represents more than 70 percent of the CFLs installed through the program. Nevertheless, the on-site visits did not allow Econoler to confirm that 23 watt CFLs had been used to replace old incandescent lamps with an equivalent light output. Since participants could not provide more precise information on replaced wattage, the best way to remedy this lack in the future evaluation would be to collect information on replaced wattage during the direct installation. |
|                                   | <b>12. Increase the number of on-site visits for the next evaluation:</b> During on-site visits, a significant level of removal was found for faucet aerators and LED nightlights. However, the precision level was not sufficient to establish an installation rate to apply to all the LED nightlights and faucet aerators installed through the program. For the next evaluation, the number of on-site visits should be sufficient to establish an installation rate with a reasonable margin error, at least for CFLs, LED nightlights and faucet aerators.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                   | <b>13. Collect information on air conditioning:</b> Econoler recommends collecting and compiling information related to participants' use of air conditioning. This information would be useful to calculate the interactive effects factor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## APPENDIX II - PROGRAM THEORY

| Low Income Renter Program                                                                      |                                                                                                                                            |                                                                                                                                                       |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                            |                                                                                                                                                       |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                            |                                                                                                                                                       |
| #                                                                                              | Program Theory                                                                                                                             | Performance Indicators                                                                                                                                |
| 1                                                                                              | The program delivery agent (DA) will work with the municipal and provincial housing authorities to gain easy access to low-income renters. | Leads provided by municipal and provincial housing authorities after getting permission from tenants.                                                 |
| 2                                                                                              | The DA will use the leads provided by the housing authorities to enroll participants.                                                      | Leads that result in enrolments from total leads.                                                                                                     |
| 3                                                                                              | The program DA has selected nine soft energy-efficient products to install directly in low-income dwellings, free of charge.               | List of the measures included in the kit and date of change, addition or retrieval in a record along with their deemed savings.                       |
| 4                                                                                              | Some educational material will be prepared for participating tenants to be given by the DA after installing the energy-efficient products. | Educational and training material                                                                                                                     |
| 5                                                                                              | The DA will install the products in tenants' apartments and provide educational material on EE.                                            | Tracking data and activities about installations and educational activities. Entering them into the program database.                                 |
| 6                                                                                              | The DA sends installation data each month to ENSC.                                                                                         | Same as #5                                                                                                                                            |
| 7                                                                                              | Installation of all or part of these products will result in energy savings and bill reductions.                                           | Tracking gross energy and demand savings with the number of products and their deemed savings.                                                        |
| 8                                                                                              | The program will have an educational component that should increase participant awareness for EE.                                          | This could be evaluated in a future assessment but needs a baseline for comparison.                                                                   |
| 9                                                                                              | If housing authorities include energy-efficient products as a standard practice, there will be more sustainable energy savings.            | Future evaluations and program participation will be a good indicator of sustainability.                                                              |
| 10                                                                                             | Increasing the number of participants will lead to increased availability of energy-efficient equipment.                                   | The number of products installed in these types of residences, should results in an accelerated rate of penetration in the market for these products. |

## APPENDIX III - DEMOGRAPHICS

Over one-third of respondents reside in a townhouse or duplex with shared adjacent walls (36%). Two in 10 live in a single story apartment building or row house (21%), while a similar proportion reside in an apartment building of five stories or more (17%). Only one in 10 respondents live in an apartment building with fewer than five stories (10%) or in detached, single-family houses (10%).

**Table 31: Type of Residence**

| <b>Residence</b>                                    | <b>2011</b> |
|-----------------------------------------------------|-------------|
| <i>Sample Size</i>                                  | <i>70</i>   |
| Townhouse/duplex with shared adjacent walls         | 36%         |
| Row house (single story apartment building)         | 21          |
| Apartment building that has five or more stories    | 17          |
| Apartment building that has fewer than five stories | 10          |
| Detached single-family home                         | 10          |
| Seniors housing                                     | 4           |
| Don't know                                          | 1           |

One-third of participants live in a single or two-bedroom residence (33%). One-half of respondents have three bedrooms in their home (50%), while close to two in 10 live in a residence with four bedrooms (16%).

**Table 32: Number of Bedrooms in Home**

| <b>Bedrooms</b>    | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>70</i>   |
| One                | 27%         |
| Two                | 6           |
| Three              | 50          |
| Four               | 16          |
| Don't know         | 1           |

Just over one-third of participants are the only residents of their abode (36%). Four in 10 respondents indicate living in a residence with two or three people in total (40%), and another two in 10 say their residence houses four or more people (21%).

**Table 33: Number of People in Residence**

| <b>People in Residence</b> | <b>2011</b> |
|----------------------------|-------------|
| <i>Sample Size</i>         | <i>70</i>   |
| One                        | 36%         |
| Two                        | 14          |
| Three                      | 26          |
| Four or more               | 21          |
| Don't know                 | 3           |

Three-quarters of survey respondents are responsible for paying their entire electric bill (74%). One in 10 indicate that their electricity is included in their rent (7%), while only a minority indicate that they pay a shared portion of their electric bill (4%) or pay a flat fee to the housing authority of their place of residence (4%).

**Table 34: Electric Bill Payment Situation**

| <b>Pay Electric Bills</b>               | <b>2011</b> |
|-----------------------------------------|-------------|
| <i>Sample Size</i>                      | <i>70</i>   |
| Pay all of the electric bill            | 74%         |
| Included in rent                        | 7           |
| Pay a portion of the electric bill      | 4           |
| Pay a flat fee to the housing authority | 4           |
| Other                                   | 4           |
| Refused                                 | 1           |
| Don't know                              | 4           |

The survey includes adult participants of all age groups. A large minority of respondents are 55 years or older (40%), while a similar proportion is aged between 35 to 54 years (36%). Adult participants 34 years and younger comprise a sizeable minority (23%).

**Table 35: Age**

| <b>Age</b>         | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>70</i>   |
| 18 to 24           | 10%         |
| 25 to 34           | 13          |
| 35 to 44           | 20          |
| 45 to 54           | 16          |
| 55 to 64           | 20          |
| 65 or over         | 20          |
| Refused            | 1           |

Slightly under one-half of respondents have a high school graduation diploma and/or some post-secondary education (46%). Three in 10 indicate having less education than a high school graduation diploma (29%). A combined two in 10 respondents indicate having a certificate, diploma or degree from a college (11%), or a university (7%).

**Table 36: Education**

| <b>Education</b>                                          | <b>2011</b> |
|-----------------------------------------------------------|-------------|
| <i>Sample Size</i>                                        | <i>70</i>   |
| Less than high school graduation diploma                  | 29%         |
| High school graduation diploma and/or some post-secondary | 46          |
| College certificate or diploma                            | 11          |
| University degree, certificate or diploma                 | 7           |
| Other                                                     | 1           |
| Refused                                                   | 3           |
| Don't know                                                | 3           |

A large minority of respondents indicate that their annual household income is less than \$15,000 (43%). Just over one in 10 reports an annual household income of between \$15,000 and \$24,999 (14%), while a comparable proportion make any amount over \$25,000 (14%). Of note, a relatively high proportion did not answer this question (29%).

**Table 37: Annual Household Income**

| <b>Income</b>       | <b>2011</b> |
|---------------------|-------------|
| <i>Sample Size</i>  | <i>70</i>   |
| Less than \$15,000  | 43%         |
| \$15,000 - \$24,999 | 14          |
| \$25,000 - \$34,999 | 10          |
| \$35,000 - \$49,999 | 3           |
| \$50,000 - \$69,999 | 0           |
| \$70,000 - \$79,999 | 1           |
| Refused             | 19          |
| Don't know          | 10          |

The vast majority of respondents are female (80%), with only two in 10 being male (20%).

**Table 38: Gender**

| <b>Income</b>      | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>70</i>   |
| Male               | 20%         |
| Female             | 80          |

## **APPENDIX IV - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Low Income Renter**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

#### **Page 39**

C: I understand that this is a new program, but already changed name once, from Low Income Direct Install to Low Income Renter? Care to comment?

Q: What are you doing with the products that you replaced?

C: Most of the program objectives, beside electricity and bill savings are soft (educational, comfort, awareness, etc.) These could be difficult to evaluate since they are intangible benefits.

Q: The program justification is documented in point 1.26.1. That is good; it provides the WHY or the justification for that program.

#### **Page 41**

Q: Do you have the source and variables used to estimate gross savings for each of the 9 products?

#### **Page 42**

C: The outreach and marketing section seems to be well organized to capture as many renters as possible. This is a good strategy.

Q: what is the participation process? Will you have a process flow chart?

C: The source of space heating is not included in the data tracking provided by Summerhill Group, Why is that? If you need to calculate interactive effect you need the space-heating energy source.

Q: The kW and kWh savings are presumed gross savings?



C: It would be useful to know what kind of arrangement there is between the building administration and the low-income renter (for each building) in regards to the method of sharing the cost of electricity. This could have an impact on many of the program objectives. For example renter who pays only a fraction of his consumption could not be easily encouraged to save energy, etc.

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Nowhere do we find a detailed description of the delivery agent role. Will that be developed? So we can develop the questions of process evaluation when addressing the delivery agent.

C: I haven't see a program theory, but the logic model and its table should do for now.

Q: is there a process flow chart?

Q: what distortion effects, if any were predicted in that program? To get to the net savings

Q: did you identify any particular barriers that justified the offering of that program? (Usually a program addresses a barrier)

Q: is there a participant form? Is it Summerhill Group that keeps the records?

Q: Do you plan to do a post evaluation cost effectiveness test?

Q: since this a new program, did you have an evaluation plan designed at the same time the program was designed?

Q: Will there be a detailed program marketing strategy along with performance indicators?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Any other subject the PM wishes to include in the process examination of the program partners and or participants.

Thank you very much for your time and cooperation.

---

## **APPENDIX V - INTERVIEW GUIDE WITH DELIVERY AGENT AND CONTRACTOR**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Low-Income Renter**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion

☐ A lot of confusion

☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

☐ Not applicable

☐ It was the same Program Administrator

☐ I had to deal with a new PA

☐ The transition went smoothly

☐ The transition caused some delays or adjustments

☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

☐ Yes

**What was the complaint about?**

☐ No

☐ Don't Know

☐ Refused

☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Low-Income Renter Program**

**Q9- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other program partners or subcontractors (Clean Nova Scotia) in this program?**

**Score:**

**Q9a - If your answer to Q9 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q10 – Who provides you with leads for potential participants?**

**Q11- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and or/the participants?**

- ☐ Yes

What was the confusion about?

- ☐ No
- ☐ Don't know

**Q12 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

**Q13- What is your opinion in regard to the program name that has changed since its first implementation (Low-Income Direct Install to Low-Income Renter)?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion
- ☐ Not Applicable

**Q15- Did you receive any complaints from other parties involved in the delivery of that program?**

- ☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party.)
- ☐ No
- ☐ Don't know
- ☐ Not applicable

**Q15a- What was the complaint about?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX VI - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Questionnaire**

#### **Efficient Products - Low Income Direct Install**

October 5, 2011

I1. Hello may I please speak with [INSERT NAME]?

1. Yes [GOTO INTRODUCTION]

2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

[INTRODUCTION]

V1. Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your household recently participated in Efficiency Nova Scotia's program to upgrade your lighting and install other energy efficient products. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about ten minutes. Is this a good time for you?

1. Yes [CONTINUE]

2. No, I don't remember the program / Don't know

[PROMPT: "Are you sure? Someone would have come to your house and installed energy-saving measures for you to save energy and money?" RECODE AS "YES" IF THE PROMPT WORKS;

IF RESPONDENT STILL SAYS NO: Is there someone else in the household who would know about having participated in the Efficiency Nova Scotia program? THANK AND TERMINATE.]

a. Yes: [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

b. No [THANK & TERMINATE]

3. No, but they came to my previous home CONTINUE

99. Refused [THANK AND TERMINATE]

[IF REFUSED, ASK "Can we schedule a more convenient time for you to conduct this survey?"

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]



---

**Section P- Screening, Reasons for participating and Overall satisfaction with the program**

P1. Do you still live in the house that was part of the program?

1. Yes [GO TO P2]
2. No – [CONTINUE] \_\_\_\_\_
98. (Don't Know) [ASK FOR THE PERSON WHO WOULD KNOW]
99. (Refused) [THANK AND TERMINATE]

[IF P1 = 2 (NO): Please answer the survey questions based on the house that went through the program.]

P2. What was the SINGLE most important reason you agreed to participate in the program?  
[ACCEPT ONE RESPONSE] [DO NOT READ]

1. (To save on energy costs/bills)
2. (Comfort)
3. (To receive free compact fluorescent bulbs)
4. (To receive free LED lights)
5. (To help the environment)
6. (Reduce greenhouse gases)
7. (No cost for services/program was free)
8. (To receive free power bars)
9. (To reduce my water consumption)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know) [GO TO P4]
99. (Refused) [GO TO P4]

P3. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE. SAME LIST AS P2]

P4. Before participating, did you have any concerns about taking part in the program?

1. Yes [ASK P5]
2. No
98. Don't know)
99. (Refused)

- P5. [IF P4 = 1] What were those concerns? [DO NOT READ. ACCEPT ALL RESPONSES]
1. (That I wouldn't be eligible)
  2. (That I'd have to pay something)
  3. (Didn't believe it was really free)
  4. (Wouldn't like what they gave me)
  5. (That products offer would cause health risks)
  6. (Concern that participation will affect eligibility for other assistance programs – social assistance, heating assistance rebate)
  96. (Other) [SPECIFY \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- P6. Using a scale from 1 to 5, where 1 means "very dissatisfied" and 5 means "very satisfied", please tell me how satisfied you are with your OVERALL experience with the program. [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused] DO NOT ACCEPT A RANGE
- P7. [IF DISSATISFIED—P6= 1 or 2] You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were dissatisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE – SAME LIST AS P8]
- P8. [IF DISSATISFIED—P6= 1 or 2] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASON. ACCEPT MULTIPLE]
1. (The installation took too long)
  2. (I expected more)
  3. (I don't like the light bulbs I received)
  4. (I don't like the insulation/wrap upgrade)
  5. (I don't like the low flow showerhead installed)
  6. (I don't like the low flow faucet aerators installed)
  7. (I did not like the evaluator who visited the home)
  96. (Other) [SPECIFY \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- P9. [IF P6=3] You indicated that you were neither satisfied nor dissatisfied with the program overall. For what reasons were you not satisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE – SAME LIST AS P8]

P10. [IF SATISFIED P6=5 or 5] What was the SINGLE most important reason why you were satisfied with the program overall? PROBE: Anything else? [PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE. RECORD FIRST/SUBSEQUENT MENTIONS SEPARATELY] RECORD VERBATIM RESPONSE

Now I am going to read a list of specific aspects of the program. Using a scale from 1 to 5, where 1 means “very dissatisfied” and 5 means “very satisfied”, please tell me how satisfied you are with your experience with each aspect of the program. . [DO NOT RANDOMIZE] [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused] DO NOT ACCEPT A RANGE

P11. Overall communication from the program      1      2      3      4      5      98/99

P12. Time Required to Complete Work                      1      2      3      4      5      98/99

P13. Energy conservation measures installed      1      2      3      4      5      98/99

P14. Quality of the work completed                      1      2      3      4      5      98/99

P15. Has the information you received during the visit from the installer changed your behavior in terms of how you use energy at home?

- 1. Yes [ASK P16]
- 2. No
- 98. (Don't know)
- 99. (Refused)

P16. [IF P15=1] How has your behavior changed? PROBE: Anything else? [DO NOT READ. ACCEPT ALL RESPONSES]

- 1. (I turn off my lights now)
- 2. (I set my heating thermostat lower)
- 3. (I set my water heater thermostat lower)
- 4. (I hang my clothes to dry)
- 5. (I use less hot water to wash my clothes)
- 6. (I use fans instead of air conditioning)
- 7. (Close doors and windows)
- 8. (Turn off appliances)
- 96. (Other) [SPECIFY \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

**Section VA - Verify actions removed**

VA2. Among the energy efficiency measures installed through the program, were there any that you later chose to remove from your home?

1. Yes
2. No [SKIP TO SM2]
98. (Don't know) [SKIP TO SM2]
99. (Refused) [SKIP TO SM2]

[IF YES TO VA2]

VA3. Which of the measures did you later choose to remove from your home? POSE IN ORDER

1. Insulation tank wrap, pipe insulation
2. Low flow showerheads
3. Low flow faucet aerators
4. CFLs, that is, compact fluorescent light bulbs
5. CFL compatible floor lamps
6. LED nightlights
7. Seasonal LED lights
8. Power bars with integrated timer
96. Other (specify: \_\_\_\_\_)
98. (Don't know)
99. (Refused)

1. Yes
2. No
98. (Don't know)
99. (Refused)

VA4. FOR EACH MEASURE RESPONDENT CHOSE TO REMOVE (VA3): Why did you choose to remove [INSERT EACH 'YES' RESPONSE FROM VA3] from your home? PROBE: Anything else? [DO NOT READ]

1. (Did not work like I thought it would)
2. (Too complicated to use)
3. (Did not like the way it looked in my space)
4. (Worried that the light bulbs may cause health risks)
5. (Hassle factor, too much disruption to my daily routine)
6. (Did not believe any changes will result in lower energy bills)
7. (Did not trust in energy professionals installing new measures)
96. Other [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

### **Section SM - Effects of the energy conservation measures on their energy bills**

SM2. According to our information, the measures installed by the program would have taken place in [InstalledDateJob.ProcessingDate]. Since these measures were installed, what changes, if any, have you noticed in your energy bills? Have ... READ STATEMENTS IN ORDER - RECORD ONE RESPONSE

1. Your bills gone down
  2. Your bills gone up, or
  3. Has there been no change in your bills
- VOLUNTEERED
4. (It is too soon to tell)
  98. (Don't know)
  99. (Refusal)

### **Section IM - Impact of measures**

IM1. Please indicate how, if at all, each of the following has changed since participating in the program. On a scale of 1 to 5, where 1 means "no improvement" and 5 means a "considerable improvement" how much has \_\_\_\_\_ improved? ROTATE/RANDOMIZE - DO NOT ACCEPT A RANGE. .

- a. The Comfort of the home \_\_\_\_\_
- b. The Reduction in energy bills \_\_\_\_\_
- c. Your interest in Energy efficiency \_\_\_\_\_
- d. Your knowledge of Energy efficiency \_\_\_\_\_

IM2. [POSE TO ALL RESPONDENTS] How, if at all, have the energy savings measures installed as a result of the program impacted your COMFORT LEVEL in your home? Have they:  
[RANDOMIZE AND RECORD EACH]

1. Led to noticeably fewer drafts throughout home
2. Provided longer lasting hot water
3. Improved indoor lighting
4. Improved outdoor lighting
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

- 1 (Yes)
- 2 (No)
- 98 (Don't know)
- 99 (Refused)

## **Section R - Interest in other possible measures and recommendations**

R1. Are there any energy savings products or measures that were not covered by the program that you would like to have had installed through the program?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

[IF R1= YES]

R2. Which energy efficiency products or measures would you like to have had installed through the program? [DO NOT READ. ACCEPT MULTIPLE]

1. (dishwasher)
2. (washing machine)
3. (dryer)
4. (windows/envelope)
5. (refrigerator)
6. (freezer)
7. (ventilation)
8. (thermostats)
9. (air sealing/weather stripping)

- 10. (toilets)
- 96. Other [SPECIFY \_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

R3. Do you have any recommendations that you think would help improve the program? PROBE:  
Anything else?

- 1. (Offer more products/measures to be installed)
- 2. (Offer more information on the products/measures installed)
- 3. (Allow participants to apply for the program on their own if they wish to)
- 4. (Complete work faster)
- 5. (Improve quality of work)
- 6. (Improve communication)
- 7. (No recommendation)
- 96. (Other [SPECIFY \_\_\_\_\_])

#### **Section D - Demographic characteristics**

[ASK ALL RESPONDENTS]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-7, then 96; SELECT ONE RESPONSE]

- 1. Apartment building that has fewer than five stories
- 2. Apartment building that has five or more stories
- 3. Row house (Single story apartment building)
- 4. Detached single-family home
- 5. Semi-detached house
- 6. Mobile home or house trailer
- 7. Townhouse or duplex which shared adjacent walls
- 96. Other [SPECIFY: \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

D2. How many bedrooms are in your home? [98=DK; Enter zero for a studio apartment with no bedrooms]

D3. Regarding the payment of your electric bill, which one of the following situations applies to you? [RECORD ONE MENTION] READ IN ORDER

1. You pay all of the electric bill
2. You pay a portion of the electric bill
3. You pay a fee to the housing authority based on my electricity usage
4. You pay a flat fee to the housing authority
96. (Other) [Specify\_\_\_\_\_]
98. (Don't know)
99. (Refused)

D4. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]

D5. What is your age group? Are you ....: [READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D6. What is the highest grade of schooling completed by the head of your household? [READ IF NECESSARY]

1. (Less than high school graduation diploma)
2. (High school graduation diploma and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University degree, certificate or diploma)
97. Other (SPECIFY: \_\_\_\_\_)
98. (Don't know)
99. (Refused)



D7. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
8. \$80,000 or more
98. (Don't know)
99. (Refused)

D8. [DO NOT READ] Gender

1. Male
2. Female

[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK YOU FOR TAKING THE TIME TO RESPOND TO THIS SURVEY.]

## APPENDIX VII - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Order ID: \_\_\_\_\_

Site contact name: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

Type of dwelling:      Single-unit: ☐      Semi-attached: ☐      Other: ☐  
                                  Duplex/Triplex: ☐      Multi-unit: ☐

### 2 INFORMATION RELATIVE TO MEASURES

| CFLs (Twister)                                         |               |                |            |
|--------------------------------------------------------|---------------|----------------|------------|
|                                                        | Database Info |                | Validation |
| Date of installation:                                  | _____         | _____          | _____      |
| Number of 13-watt units installed:                     | _____         | _____          | _____      |
| Number of 23-watt units installed:                     | _____         | _____          | _____      |
| Type of lamp replaced ( <i>contact declaration</i> ):  | _____ Inc.    | _____ Halogens | _____ CFLs |
| Power of lamp replaced ( <i>contact declaration</i> ): | _____ W       | _____ W        | _____ W    |
| Number of units removed after installation:            | _____         |                |            |
| Explanation ( <i>contact declaration</i> ):            | _____         |                |            |
| Hours of use [hrs/day] ( <i>contact declaration</i> ): | _____         |                |            |

**LED Nightlights**
**Database Info**
**Validation**

Date of installation:

Number of units installed:

Power of LED lamps [watt]:

Type of lamp replaced (*contact declaration*):



Power of lamp replaced (*contact declaration*):

Number of units removed after installation:

Explanation (*contact declaration*):



Hours of use [hrs/day] (*contact declaration*):



**CFL Compatible Floor Lamps**
**Database Info**
**Validation**

Date of installation:

Number of units installed:

Number of lamps per fixture:

Power of CFL lamps [watt]:

Type of lamp replaced (*contact declaration*):



Power of lamp replaced (*contact declaration*):

Number of units removed after installation:

Explanation (*contact declaration*):



Hours of use [hrs/day] (*contact declaration*):

**Power Bars with Integrated Timer**

|                                             | Database Info | Validation |
|---------------------------------------------|---------------|------------|
| Date of installation:                       | _____         | _____      |
| Number of units installed:                  | _____         | _____      |
| With timer or automatic control?:           | _____         | _____      |
| If timer, is the timer in operation?:       | _____         | _____      |
| Number of units removed after installation: | _____         | _____      |
| Explanation ( <i>contact declaration</i> ): | _____         | _____      |
| Type of electronic devices plugged:         | _____         | _____      |

**Faucet Aerators**

|                                             |       |
|---------------------------------------------|-------|
| Date of installation:                       | _____ |
| Number of units installed:                  | _____ |
| Location:                                   | _____ |
| Number of units removed after installation: | _____ |
| Explanation:                                | _____ |

**Low-Flow Showerheads**

|                                             | Database Info | Validation |
|---------------------------------------------|---------------|------------|
| Date of installation:                       | _____         | _____      |
| Number of units installed:                  | _____         | _____      |
| Number of units removed after installation: | _____         | _____      |
| Explanation ( <i>contact declaration</i> ): | _____         | _____      |
| Source of energy for water heating:         | _____         | _____      |

### Pipe and Tank Insulation

|                                               | Database Info | Validation |
|-----------------------------------------------|---------------|------------|
| Date of installation:                         | _____         | _____      |
| Tank wrap installed (yes/no):                 | _____         | _____      |
| Pipe insulation (yes/no):                     | _____         | _____      |
| Length of pipe insulated [foot]:              | _____         | _____      |
| Tank size [liters/gallons]:                   | _____         | _____      |
| Source of energy for water heating:           | _____         | _____      |
| Primary source of energy for space heating:   | _____         | _____      |
| Approx. % of usage:                           | _____         | _____      |
| Secondary source of energy for space heating: | _____         | _____      |





# **EFFICIENT PRODUCTS – MULTI-UNIT RESIDENTIAL RENTER PROGRAM IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**



Final Report



February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Multi-Unit Residential Renter (MURR) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and a delivery agent, five on-site visits and a telephone survey of 30 program participants. The impact evaluation also claimed the savings from the direct installation of energy-efficient products through two pilot projects: the Clean Nova Scotia New Waterford pilot project and the Nedco Homeowner pilot project.

## **PROGRAM OVERVIEW**

The MURR program was launched as a pilot program in 2011. The program was meant to engage and educate tenants about energy efficiency. Multi-unit residential buildings across the Halifax Regional Municipality, the Cape Breton Regional Municipality (CBRM) and the Town of Antigonish were selected to hold events in common areas, during which tenants could be informed one-on-one and ask energy efficiency-related questions.

The program also conducted direct installs of energy-efficient products in tenants' units. Walk-through audits were performed, during which compact fluorescent lamps (CFLs), power bars with integrated timer, low-flow showerheads, faucet aerators, pipe insulation and hot water tank wraps were installed.

These activities were organized and conducted by the program delivery agent, Summerhill.

The program targeted net electricity savings of 0.55 GWh and demand savings of 0.09 MW for the year 2011.

## **KEY FINDINGS**

The program, together with the pilot projects, achieved the direct installation of products in 853 households for the year 2011. In terms of net energy savings, they generated 0.651 GWh.

### **Satisfaction**

Satisfaction towards the program is very high among participants. Indeed, most participants expressed their satisfaction with the overall program. In fact, no participant mentioned being either dissatisfied or very dissatisfied with the overall program as well as with the following aspects of the program: the time required to complete the work, the energy evaluation of their apartment, and the products installed. Participants are not the only ones satisfied with the MURR program, the program partners interviewed also shared positive comments.

## **Installation of Products**

During the telephone survey, participants were asked to confirm the products that had been installed through the program. The survey results demonstrate the accuracy of the information found in the tracking sheet. Very few discrepancies were observed between the survey results and the tracking sheet. Moreover, no removal phenomenon for a particular product has been identified during the survey. This result was confirmed by the installation rate of 100 percent observed for CFLs during on-site visits.

However, it was observed during on-site visits that three out of five participants were using their power bar but without the timer. The fact that the power bars with integrated timer are not used correctly has an impact on the program energy savings since the timer is the component of the power bar responsible for the energy savings generated. This observation has resulted in a low installation rate for power bars with integrated timer.

## **Program Energy Savings**

To calculate the net savings of the MURR program in 2011, Econoler reviewed the parameters and the source of data used in Efficiency Nova Scotia Corporation's (ENSC) unitary savings estimations for each product category. Moreover, Econoler calculated installation rates using results from the on-site visits and included interactive effects. The free-ridership and internal spillover levels measured as part of the participant survey were also taken into account in the evaluation of net savings. A free-ridership level of 17 percent was captured, while no significant level of spillover was identified. Survey results reveal that most participants would not have installed any or some of the energy-efficient products in the absence of the program, which proves to ENSC the necessity to continue targeting multi-unit customers. However, the intentions varied between the products, which explains the presence of a certain, yet low, level of free-ridership. For instance, 96 percent of participants did not plan to install power bars with integrated timer before participating in the program while only 45 percent of participants declared the same for CFLs.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 17%         |
| Spillover Level      | 0%          |
| Net-to-Gross Ratio   | 0.83        |

Using the revised unitary savings values, the installation rates and the interactive effects factors, the evaluation revealed that the MURR program had generated net energy savings of 0.651 GWh and demand savings of 0.104 MW at the generator in 2011. These results include the savings generated by the two additional pilot projects.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Installed Gross Savings</b> | <b>Installed Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------------------------|---------------------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked savings from ENSC | 0.725 GWh                    | 0.725 GWh                      | 0.725 GWh                                               | 0.85        | 0.616 GWh          |
| <b>Evaluation results</b> | <b>0.903 GWh</b>             | <b>0.903 GWh</b>               | <b>0.785 GWh</b>                                        | <b>0.83</b> | <b>0.651 GWh</b>   |
| <b>Demand Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked savings from ENSC | 0.116 MW                     | 0.116 MW                       | 0.116 MW                                                | 0.85        | 0.098 MW           |
| <b>Evaluation results</b> | <b>0.144 MW</b>              | <b>0.144 MW</b>                | <b>0.125 MW</b>                                         | <b>0.83</b> | <b>0.104 MW</b>    |

The net evaluated savings exceeded those tracked by ENSC. The upward revision of the unitary savings values for CFLs, programmable thermostats, faucet aerators and low-flow showerheads are the main factors that explain this difference. The table below summarizes the adjustments applied to the unitary savings estimates used in the tracking sheet.

**Table 3: 2011 Program Unitary Savings Adjustments**

| Products                         | Unitary Savings Values (kWh/year) |           |
|----------------------------------|-----------------------------------|-----------|
|                                  | Tracked                           | Evaluated |
| 13 watts CFLs                    | 41                                | 46.3      |
| 23 watts CFLs                    | 41                                | 69.5      |
| CFL torchieres*                  | 241                               | 69.5      |
| LED nightlights*                 | 26                                | 29.3      |
| Programmable thermostats*        | 63.15                             | 223       |
| Electric kettles*                | 49                                | 49        |
| Faucet aerators                  | 86                                | 176.3     |
| Low-flow showerheads             | 157                               | 377       |
| Power bars with integrated timer | 53                                | 53        |
| Pipe insulation*                 | 74                                | 74        |
| Hot water tank wraps*            | 399                               | 270       |

\*Products that were only installed as part of the two pilot projects

Moreover, interactive effects were evaluated and added to the savings calculations, which allowed for a more precise estimation of program energy and demand savings.

## RECOMMENDATIONS

Even though ENSC has decided not to go forward with the MURR pilot program in its present form, mentions of possible improvements remain relevant since the program is being reconfigured in 2012. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- MURR-R1. Review marketing material used for lobby events:** The program partners have mentioned that the information related to time commitment shown on the marketing posters used to promote the lobby events was misleading. This resulted in tenants not showing up to the events. If lobby events are part of a reconfigured program, the marketing posters should accurately describe the time commitment and involvement required from the tenants. This would prevent losing tenants who would have showed up to the events but did not because the information was confusing.
- MURR-R2. Improve measure sustainability:** The on-site visits revealed that the products installed through the program were rarely removed after installation. This observation proves the high level of participant satisfaction with the products installed and reflects the benefits of informing participants, during special events or walk-through audits, about the advantages of the products installed. However, the on-site visits also revealed that power bars with integrated timer are not used in a way that allows for energy savings, meaning that participants do not activate the timer that controls the power bar. To maintain the sustainability of the savings generated by the installation of such products, Econoler recommends giving participants more information on the benefits and on the use of power bars with integrated timer. This strategy could help participants use the product correctly as they would be aware of all its advantages.
- MURR-R3. Continue to offer programs targeting the multi-unit renter market:** Multi-unit renters are often less interested in energy efficiency because they are less likely to install energy-efficient products in a home they do not own and where, in some cases, they are not responsible for paying the electricity bills. Indeed, the low level of free-ridership measured through the participant survey reveals that most participants would not have installed any energy-efficient products in the absence of the program. This result shows the need for increasing awareness for energy efficiency in this market.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION**

In August 2011, Efficiency Nova Scotia (ENSC) launched the Multi-Unit Residential Renter (MURR) program. This pilot program aims to educate and engage tenants of multi-unit residential buildings about energy efficiency. This was achieved through events held in the common areas of selected multi-unit properties and by directly installing energy-efficient products in tenant units.

More precisely, the events held in building common areas offered the opportunity to educate tenants one-on-one and engage them in discussions surrounding energy efficiency. ENSC's other programs, such as the Appliance Retirement program, were also promoted during these events. Walk-through audits were also performed on selected units, during which the DA installed compact fluorescent lamps (CFLs), power bars with integrated timer, low-flow showerheads, faucet aerators, pipe insulation and hot water tank wraps. The program also provided tenants with the opportunity to retire and recycle their old dehumidifiers and room air conditioner units in exchange for a rebate coupon from a participating retailer.

Buildings across the Halifax Regional Municipality, the Cape Breton Regional Municipality (CBRM) and the Town of Antigonish were targeted for this program. Summerhill Group was the delivery agent (DA) for the program.

The program objective was to visit 26 selected locations in 2011. Ultimately, 18 locations were visited through the program and a total of 306 tenants received direct installation of energy-efficient products. The program aimed to achieve net electricity savings of 0.55 GWh and demand savings of 0.09 MW for the year 2011.

Moreover, ENSC conducted two additional pilot projects this fall: the Clean Nova Scotia New Waterford pilot project and the Nedco Homeowner pilot project. Both pilot projects used a direct install approach to installing energy-efficient products in single- and multi-family homes of New Waterford. The following products were installed through the pilot projects:

- > 13 watt CFLs;
- > 23 watt CFLs;
- > CFL torchieres;
- > LED nightlights;
- > programmable thermostats (only installed in Nedco Homeowner pilot project);
- > electric kettles (only installed in Clean Nova Scotia New Waterford pilot project);
- > pipe insulation;
- > hot water tank wraps.

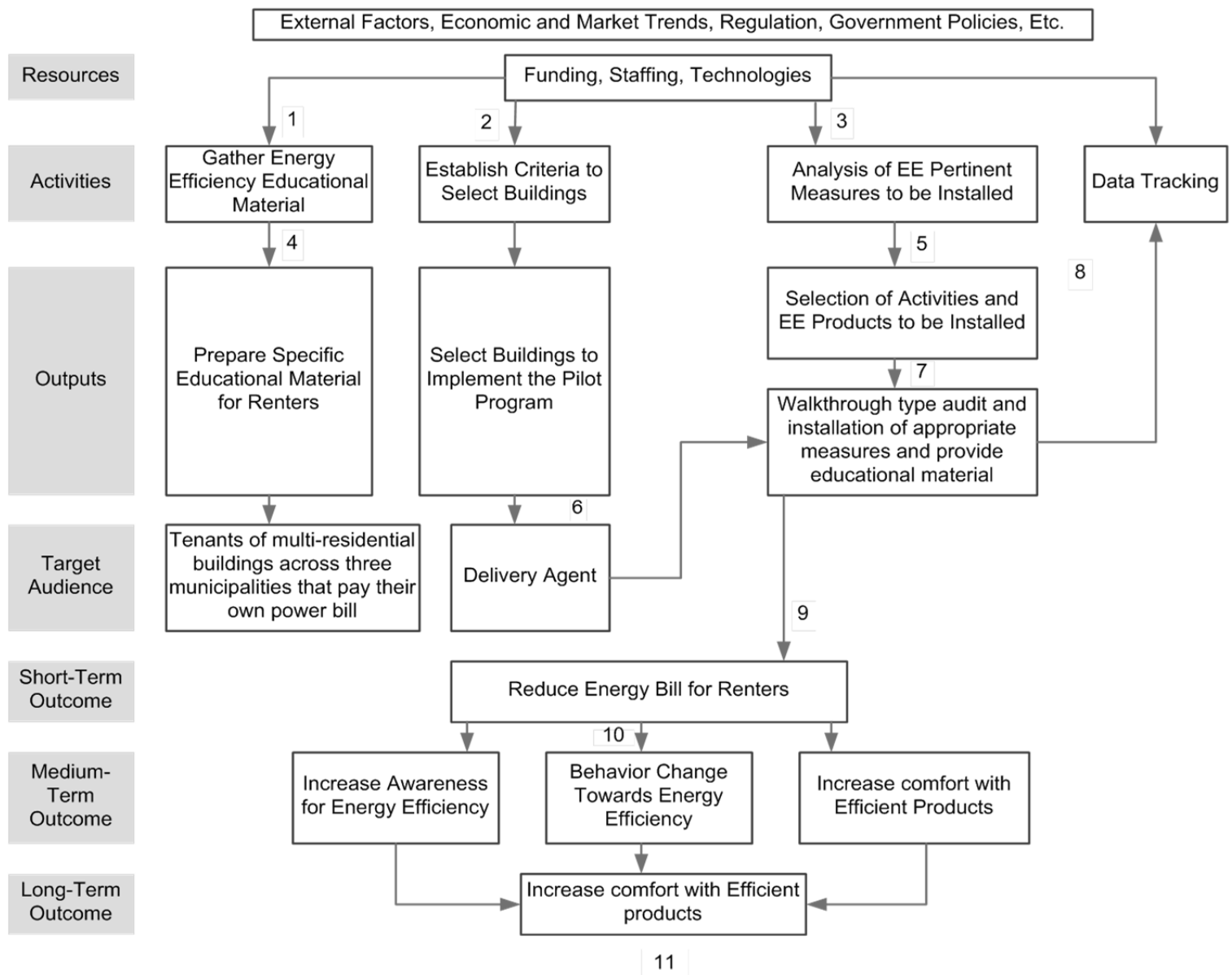
Since these two pilot projects used a direct install approach and some of the products installed were similar to those installed through the MURR program (13 and 23 watt CFLs, faucet aerators and low-flow showerheads), they were bundled with the MURR program for this evaluation. However, no specific process evaluation or telephone survey was conducted for these pilot projects since they were implemented after the beginning of the evaluation field activities.



## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market<sup>1</sup>.

**Figure 1: Efficient Products – Multi-Unit Residential Renter Program Logic Model**



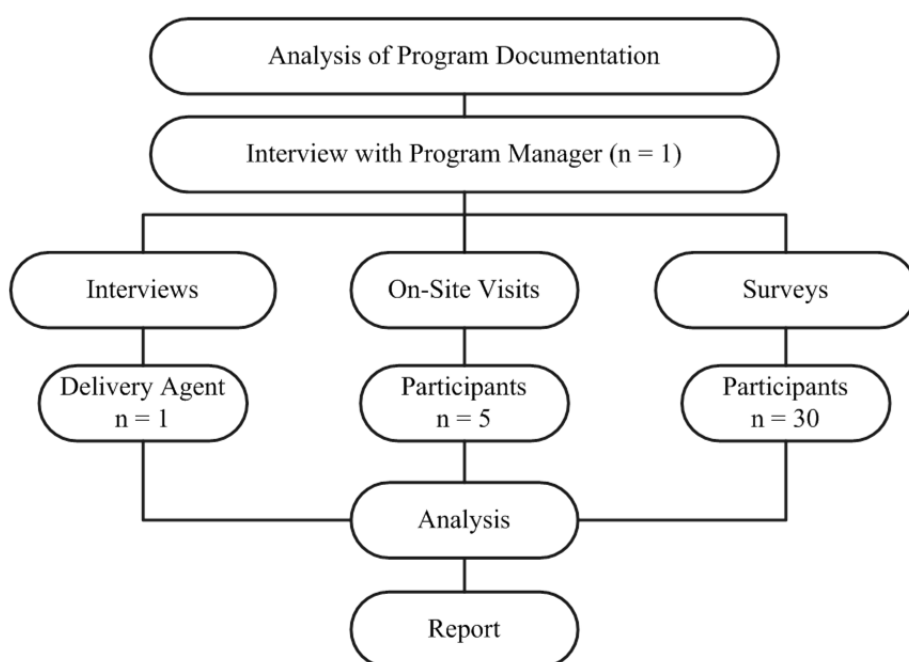
<sup>1</sup> The numbers 1 through 11 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices IV, V and VI.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the MURR program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was obtained primarily from the following sources:

- > ENSC website;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart; and
- > role of the program partners.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interview for the process evaluation was finalized.

### **2.2.3 In-Depth Interview with Program Partner**

#### **Interview with Delivery Agent**

In September, one in-depth interview was conducted with the program DA. This interview was intended, among other things, to understand the DA's involvement in the program, their participation process as well as their perception and satisfaction with the program.

### **2.2.4 On-Site Visits**

In November, five on-site visits were conducted at multi-unit buildings in which program products had been installed. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These visits were used to validate the installation of products in accordance with the data found in the tracking sheet and, when such was the case, to establish the reason for participants removing some products after their installation. Moreover, other product characteristics were collected through on-site observations or tenant interviews.

The methodology used for the on-site visits under the MURR program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VII.

### 2.2.5 Participant Survey

A telephone survey with a total of 30 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in November and utilized computer-assisted telephone interviewing (CATI). The average length of the survey was 12 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > spillover and free-ridership;
- > participant motivations, concerns and barriers;
- > satisfaction with the program and its products;
- > energy attitudes and behaviours.

The demographic profile of survey respondents is shown in Appendix III. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2011 telephone survey.

**Table 4: Sample Size and Sampling Error**

| Survey            | Population       | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|------------------|-----------------|-------------------------------------------|
| 2011 Participants | 306 <sup>2</sup> | 30              | ± 14.2%                                   |

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<sup>2</sup> The population for the 2011 survey was 92 participants at the time of conducting the survey.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the MURR program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." The process evaluation relied on in-depth interviews conducted with the PM and the program partners, as well as on a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

Since the MURR program is new and is still a pilot, the program manual features very little information. It is mentioned though that a more exhaustive program manual will be produced if the program is officially launched.

There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information:

**Table 5: Program Manual Content**

| <b>Program Manual Content</b>                                                                                |
|--------------------------------------------------------------------------------------------------------------|
| Document revisions                                                                                           |
| Program description (including nature or type of program)                                                    |
| Program justification                                                                                        |
| Program objectives                                                                                           |
| Incentives                                                                                                   |
| Eligibility criteria                                                                                         |
| Program partners and their roles                                                                             |
| Program barriers                                                                                             |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) |
| Details about the savings calculations and type of products                                                  |
| Budget per year                                                                                              |

| <b>Program Manual Content</b>                                                 |
|-------------------------------------------------------------------------------|
| Cost-effectiveness test results                                               |
| Market study or technical study that supports program elements or assumptions |
| Marketing plan                                                                |
| Evaluation plan                                                               |
| Program theory                                                                |
| Logic model                                                                   |
| Program process flow chart                                                    |
| Partner or participant process flow chart                                     |
| Program forms                                                                 |

Econoler reviewed the MURR program manual. For now, it contains only a description of the program and the estimated savings for each product. Therefore, Econoler proposes the following recommendations that are aimed at assisting ENSC in its production of an in-depth manual if the program is officially launched:

- > **Explain the nature of the energy audit:** It is recommended that ENSC designate the energy audit by its true nature (walk-through type audit) to avoid high expectations from renters and to be more specific in the description section of the program manual. It is also recommended that the audit protocol be well defined and include this definition in the program manual so that the PM and the Evaluator are both aware of it. For instance, energy-efficient products related to domestic hot water, such as low-flow showerheads and faucet aerators should only be installed in households with electric water heating.
- > **Provide a “base case”:** The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.
- > **Provide the parameters used to estimate program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.

- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.

### **3.3 PROGRAM TRACKING SHEET**

Econoler has reviewed the content of the tracking sheet for the MURR program. The tracking sheet presents information in one sheet.

In general, the tracking sheet is easy to use and contains the necessary fields for program administration and evaluation purposes. It provides the PM with a way to continuously monitor the number of each product installed. However, the savings are not computed in the tracking sheet.

The tracking sheet contains a field that identifies the total number of incandescent bulbs and showerheads retired. This information can be used to verify that the products installed were really used to replace less efficient products.

Although the tracking sheet is considered relatively complete and sufficient for program monitoring, some improvements could be made in the future to facilitate program evaluation. The evaluator recommends the following:

- > **Monitor the gross savings directly in the tracking sheet:** The performance of the tracking sheet could be improved by adding a table with the unitary savings value estimated for each product. That way, it would be possible to indicate the unitary savings value associated with each product and to monitor program gross savings directly in the tracking sheet.
- > **Establish a tracking sheet revision protocol:** During its review, Econoler determined that the values entered in the “Number of Incandescent Bulbs and Low-Flow Showerheads Retired” field were incorrect. This situation could be avoided simply by establishing a validation protocol that would be conducted periodically by ENSC. It would ensure that all data are correctly entered by the DA. With such a method, anomalies and missing values would be detected early on in the process.
- > **Collect all necessary information for determining the eligibility of each product installed:** A tracking sheet should provide the PM and the Evaluator with all relevant information used to ensure that program eligibility criteria are met. Therefore, Econoler recommends separating the tracking sheet into two individual columns, one listing the number of incandescent bulbs and the other showing the number of low-flow showerheads retired through the program. Moreover, for the products related to hot water savings, e.g., low-flow showerheads and faucet aerators, Econoler suggests inserting a field that specifies the energy

source used for domestic hot water heating. This way, it will be possible to confirm that product replacements have only been made where domestic hot water is electrically heated.

- > **Collect information for establishing base cases:** The PM, together with the Evaluator, should determine what fields could be added to the tracking sheet in order to collect all relevant information useful for evaluation purposes. To estimate the unitary savings value of products installed under the program, the Evaluator has to establish a base case based on the old products retired and the new products installed. For instance, in the case of lighting products, it would be useful to indicate the old lamp wattage. In the case of power bars with integrated timer, information about the group of electric devices that are plugged into the power bar could be identified in the tracking sheet. Finally, in the case of programmable thermostats installed through the Nedco Homeowner pilot project, it would be useful to indicate the type (bimetallic, electronic, etc.) of the old thermostats replaced.
- > **Collect information for establishing the line loss factor:** For this year's evaluation, since the information on rate codes was not collected for the MURR program, Econoler used the value estimated for the Efficient Products – Low Income Renter (LIR) program. Should the program be offered again in the future, Econoler recommends collecting the participants' rate codes in order to establish the line loss factor in a more precise way.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

The MURR program was launched in 2011 as a pilot program. The Evaluator noticed that this program has no evaluation plan. When a program is launched, Econoler strongly recommends preparing an evaluation plan in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.

### **3.5 RELATIONSHIP WITH PARTNERS**

The delivery agent indicated satisfaction with the program and the relationship with ENSC's team and has received no complaints from program participants.

The DA did not identify any major barriers to the program, but some challenges have arisen from its duration and timing. More specifically, the DA found that program implementation was complex because the duration of the pilot program was very short, which means that changes had to be implemented at a fast pace. Moreover, according to the DA, the pilot program did not start at the best



time: it began in August, which is a busy time of the year for property managers and impedes property manager recruitment. According to the DA, the events should have started in the middle of September. Property managers would have been less busy and the events would still have been held after the busy moving period of late summer.

The number of events included in the program design limited the capacity of the DA to allow more people to sign-up at buildings that have more than 100 units. According to the DA, the program was also faced with the fact that CFLs had already been installed in some apartments. However, the results from the site visits show that all five participants visited had an average of seven CFLs installed through the program and that they were all replacing incandescent lamps. Furthermore, the analysis of the tracking sheet indicates the same average number of CFLs installed per unit visited and the accuracy of this information was confirmed through the survey. In spite of the DA's concerns regarding the opportunities for replacing remaining incandescent lamps with CFLs, the Evaluator finds the latter satisfactory based on the results from the tracking sheet and the on-site visits.

To improve the program, the DA recommends better defining the program scope and boundaries, to limit design changes. Regarding the outreach and marketing activities, the DA feedback shows appreciation of the material and activities but leaves room for improvement. The DA suggests modifying the advertising which in some cases led tenants to believe they were required to attend a three-hour meeting and resulted in the fact that some tenants did not show up to the event. If going forward with this approach in a reconfigured program, the marketing posters should accurately describe the time commitment required from the tenants.

## 3.6 PARTICIPANT PERSPECTIVES

### 3.6.1 Participant Motivations

Survey respondents were asked why they had agreed to participate in the MURR program. The primary reason stated for taking part in the program is to save on energy costs (63%). A small number of participants named other reasons such as to save energy (10%) or to help the environment (7%). Other reasons are generally consistent with the most important mentions.

**Table 6: Reasons for Participating in Program**

| Reasons for Participating                                                                      | 2011                                |                       |
|------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|
|                                                                                                | <i>Single Most Important Reason</i> | <i>Other Reasons*</i> |
| <i>Sample Size</i>                                                                             | 30                                  | 30                    |
| To save on energy costs/bills                                                                  | 63%                                 | 10%                   |
| To save energy (general)                                                                       | 10                                  | 10                    |
| To help the environment                                                                        | 7                                   | 7                     |
| To get expert advice about what upgrades to get or how to make apartment more energy efficient | 7                                   | 7                     |
| To find out how energy-efficient the apartment was/ to have apartment evaluated                | 3                                   | 7                     |
| Free light bulbs                                                                               | --                                  | 10                    |
| Other                                                                                          | 10                                  | 10                    |
| Refused                                                                                        | --                                  | 20                    |
| Don't know                                                                                     | --                                  | 40                    |
| *Multiple responses                                                                            |                                     |                       |

### 3.6.2 Participant Barriers

The participant survey did not establish important barriers to the program. Indeed, just seven percent of respondents had concerns about taking part in the program. These two respondents were concerned about the cost of improvements or that the program was a scam.

**Table 7: Concerns About Participating in Program**

| <b>Concerns</b>    | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | 30          |
| Yes                | 7%          |
| No                 | 93          |

Just under two in 10 respondents (17%) reported that there were energy-efficient products recommended through the MURR program that they had elected not to install. The five respondents who did not choose to install some products did so because they felt they did not need these products.

**Table 8: Recommended Products Not Installed**

| <b>Recommended Products Not Installed</b> | <b>2011</b> |
|-------------------------------------------|-------------|
| <i>Sample Size</i>                        | 30          |
| Yes                                       | 17%         |
| No                                        | 80          |
| Don't know                                | 3           |

### 3.6.3 Products and Services Received Through the Program

Nearly all respondents (97%) recall a program representative coming to their place of residence and discussing the energy efficiency of their apartment as part of their participation in the MURR program.

**Table 9: Recall a Delivery Agent Discussing Program**

| <b>Recall a Delivery Agent Coming and Discussing Energy Efficiency as Part of Program</b> | <b>2011</b> |
|-------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                        | 30          |
| Yes                                                                                       | 97%         |
| No                                                                                        | --          |
| Don't know/don't recall                                                                   | 3           |

The survey required participants to confirm the products that had been installed in their apartment during program participation. The results confirm the accuracy of the information listed in the tracking sheet as well as product awareness. Indeed, all participants queried confirmed the installation of power bars with integrated timer (n = 30), CFLs (n = 25) and low-flow showerheads (n = 12). The majority of respondents listed in the tracking sheet with respect to the installation of faucet aerators also confirmed such installation (n = 10). However, three participants did not remember anything in this regard.

**Table 10: Verification of Products Installed Through Program**

| <b>Products Installed According to Records</b> | <i>Sample Size</i> | <b>Yes</b> | <b>No</b> | <b>Don't Know/Don't Recall</b> |
|------------------------------------------------|--------------------|------------|-----------|--------------------------------|
| Power bars with integrated timer               | 30                 | 100%       | --        | --                             |
| CFL bulbs                                      | 25                 | 100%       | --        | --                             |
| Low-flow showerheads                           | 12                 | 12         | --        | --                             |
| Faucet aerators                                | 13                 | 10         | 1         | 2                              |

### 3.6.4 Program Influence

The most important factor in the decision to install products through the program was the free installation of the energy-efficient products (mean score of 9.0), followed by the information or advice provided by the program advisor (mean score of 8.4) and the information received during an event held in the lobby area of the building (mean score of 8.1). Previous experience was less important, with a mean score of 5.8.

**Table 11: Importance in Decision to Install Energy-Efficient Products Through the Program**

| <b>Importance in Decision to Install Energy-Efficient Products Through the Program</b>      | <b>2011</b> |
|---------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                          | 30          |
| Mean (0=Not at all important, 10=Extremely important)                                       |             |
| The free installation of energy-efficient products offered by the program                   | 9.0         |
| Information or advice provided by the program advisor during the evaluation or installation | 8.4         |
| Information received during an event held in the lobby area of the building                 | 8.1         |
| Previous experience with a similar program either from ENSC or Nova Scotia Power            | 5.8         |

### 3.6.5 Product Removal Verification

Thirteen percent of respondents chose to remove energy-efficient products that had been installed through the MURR program. From the four respondents who had removed products, one had removed CFLs, one a low-flow showerhead, one a faucet aerator and one did not mention the product removed. The respondents who had removed the low-flow showerhead or faucet aerator did so because it did not work as they thought it would.

This removal phenomenon seems isolated and does not appear to be directed at a particular product. During the on-site visits, it was found that participants had not removed any CFLs installed through the program. However, the on-site visits did not allow validating the removal of the faucet aerators and the low-flow showerheads (see Section 4.2.14 for additional information).

**Table 12: Removal of Energy-Efficient Products Post-Program**

| <b>Products Removed</b> | <b>2011</b> |
|-------------------------|-------------|
| <i>Sample Size</i>      | 30          |
| Yes                     | 13%         |
| No                      | 87          |

### 3.6.6 Impact of Program

Respondents have seen improvement in their interest in energy efficiency (50% offering a rating of 5 or 4) since participating in the program. Similarly, 47 percent have seen improvement in their knowledge of energy efficiency.

**Table 13: Improvements Since Participating in Program**

| Improvements                   | Sample Size | 2011<br>Rating: 5= "considerable improvement"<br>and 1= "no improvement" |    |    |    |    |    |    |
|--------------------------------|-------------|--------------------------------------------------------------------------|----|----|----|----|----|----|
|                                |             | 5                                                                        | 4  | 3  | 2  | 1  | DK | NA |
| Interest in energy efficiency  | 30          | 17%                                                                      | 33 | 37 | 3  | -- | 7  | 3  |
| Knowledge of energy efficiency | 30          | 17%                                                                      | 30 | 30 | 17 | 3  | 3  | -- |

Survey results also indicate that the MURR program has had an impact on the energy behaviour of participants. Indeed, three-quarters of respondents (76%) reported that the information received through the program changed their behaviour in terms of how they use energy at home. Over six in 10 of those who reported their behaviour changed stated that they now turn off lights (64%) while four in 10 turn off appliances (41%). Two in 10 turn off taps (18%) while a small number use less hot water to wash clothes (9%) or set their heating thermostat lower (5%).

**Table 14: Information Received Changed Energy Use Behaviour**

| Changed Behaviour                  | 2011 |
|------------------------------------|------|
| Sample Size                        | 29   |
| Yes                                | 76%  |
| No                                 | 24   |
| Specific Changes in Behaviour      | 2011 |
| Sample Size                        | 22   |
| Turn off lights now                | 64%  |
| Turn off appliances                | 41   |
| Turn off taps/don't let water run  | 18   |
| Use less hot water to wash clothes | 9    |
| Set heating thermostat lower       | 5    |
| Other                              | 23   |

### 3.6.7 Satisfaction with the Program

Nearly all MURR program participants were satisfied with their overall experience with the program (96%). Of note, no respondent was dissatisfied.

**Table 15: Overall Experience with MURR Program**

| Level of Satisfaction                         | 2011 |
|-----------------------------------------------|------|
| <i>Sample Size*</i>                           | 28   |
| Very satisfied – 5                            | 75%  |
| 4                                             | 21   |
| 3                                             | 4    |
| 2                                             | --   |
| Very dissatisfied – 1                         | --   |
| *Don't know/refused removed from calculations |      |

Respondents were asked to rate various aspects of the MURR program. Results show a very high level of satisfaction. All respondents were satisfied with the program representative overall (100% offering a rating of 5 or 4) and with the information received about energy efficiency or energy savings (100%). Nearly all were satisfied with the time required to complete the work (97%), with the energy evaluation of their apartment (92%) and the products installed (90%).

**Table 16: Satisfaction with Aspects of the Program**

| Satisfaction with Aspects of Program                               | Sample Size* | 2011<br>Rating: 5= "very satisfied"<br>and 1= "very dissatisfied" |    |    |    |    |
|--------------------------------------------------------------------|--------------|-------------------------------------------------------------------|----|----|----|----|
|                                                                    |              | 5                                                                 | 4  | 3  | 2  | 1  |
| The time required to complete work                                 | 30           | 90%                                                               | 7  | 3  | -- | -- |
| The program representative overall                                 | 30           | 87%                                                               | 13 | -- | -- | -- |
| The information received about energy efficiency or energy savings | 30           | 67%                                                               | 33 | -- | -- | -- |
| The products installed                                             | 29           | 66%                                                               | 24 | 7  | -- | 3  |
| The energy evaluation of your apartment                            | 25           | 48%                                                               | 44 | 8  | -- | -- |
| *Don't know/don't recall removed from calculations                 |              |                                                                   |    |    |    |    |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > unitary savings per product;
- > installation rate;
- > energy-to-demand ratio; and
- > interactive effects.

The impact evaluation is the result of three main activities: a review of unitary savings, on-site visits and the participant survey.

The gross energy savings evaluation is based on a review of the unitary savings used in the program tracking sheet. For each product, Econoler reviewed the source of data and the parameters used in the unitary savings calculations.

On-site visits were also conducted in order to validate product installation and ensure that there had been no removal. The results of this validation were used in the impact evaluation in order to estimate the installation rate for each category of products.

Finally, the participant survey was used to estimate the free ridership ratio and evaluate if the program had generated spillover.



#### 4.1.1 On-Site Visit Sampling and Protocol

##### Sampling Methodology

Five on-site visits in participant dwellings were conducted under the framework of this evaluation. The sampling was based on the program tracking sheet that contained the list of units visited through the program and information about the products installed. In total, 92 tenants from nine different buildings participated in the MURR program in 2011 and received free installation of the products presented below.

**Table 17: Quantity Installed for Each Product**

| Product Category                 | Quantity Installed |
|----------------------------------|--------------------|
| 13 watt CFLs                     | 2,052              |
| 23 watt CFLs                     | 544                |
| Faucet aerators                  | 53                 |
| Low-flow showerheads             | 60                 |
| Power bars with integrated timer | 272                |
| Room air conditioner retirement  | 0                  |
| Dehumidifier retirement          | 0                  |

The sampling for on-site visits was made randomly. Given the small number of faucet aerators and low-flow showerheads, Econoler rather focused on CFLs and power bars with integrated timer to ensure that these products had been installed in each dwelling visited.

##### On-Site Visit Protocol

The on-site visits were conducted to validate the installation of products in accordance with the data found in the tracking sheet and, when such was the case, to establish the percentage of products removed and the reason for removing them after installation. Moreover, product information was collected through on-site observations and renter interviews in order to validate the assumptions used to calculate the product unitary savings:

- > For CFLs: the type of lamps replaced.
- > For power bars with integrated timer: equipment plugged in and correct usage of the timer.

The on-site visit protocol listing the information to be collected for each residence is presented in Appendix VII.

## **4.2 GROSS SAVINGS**

The quantities of products installed under the program are computed in the tracking sheet. For each product, ENSC uses a unitary savings estimation that is either based on past evaluation results from other programs with similar products or on other studies conducted by credible organizations. In some instances, the unitary savings estimates used by ENSC are based on a study conducted by Navigant Consulting, for which the assumptions used were not available. In that case, Econoler based its review on other studies like the 2011 Ontario Power Authority (OPA) Prescriptive Measures and Assumptions report<sup>3</sup>. This document is a reliable secondary data source in which the assumptions used for savings calculations are well documented.

### **4.2.1 CFLs**

ENSC uses the same unitary savings value of 41 kWh for all CFLs installed under its residential programs. This assumption comes from an analysis conducted for the 2009 evaluation of the Low Income program. It presented several studies indicating that 13 W CFLs show annual savings ranging from 29.6 kWh to 44.3 kWh and recommended continuing to use the 41 kWh savings assumption. This past evaluation considered that 13 W CFLs usually replace 60 W incandescent bulbs; as a result, the time of operation used to calculate the 41 kWh saving should be equal to 2.4 h/day. This, in turn, corresponds to the daily usage of interior fixtures estimated from the telephone survey conducted in 2010 under the Retail Markdown Program (RMP).

This value was revised by Econoler for two different categories. The program offers the installation of two types of CFLs: 13 watt and 23 watt CFLs. Since these two types of product are entered separately in the tracking sheet, Econoler elected to establish a different unitary savings value for each of them.

#### **13 Watt CFLs**

According to the ENERGY STAR® light output equivalency table, a 13 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Thus, the replacement of a 60 watt incandescent lamp for a 13 watt CFL is considered the base case for this product and corresponds to a displaced wattage of 47 W.

As for all ENSC residential programs, the daily usage of 13 Watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program. The value used by ENSC (2.4 h/day) was estimated from participant declarations during a telephone survey. However,

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<sup>3</sup> Ontario Power Authority (OPA), "2011 Prescriptive Measures and Assumptions," Release Version 1, March 2011.

Econoler considers that the daily usage of 2.7 hours from Hydro-Québec's metering study<sup>4</sup> is more accurate. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behaviour factors can influence the respondents' answers.

The review resulted in a unitary savings value for 13 watt CFLs of 46.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 13 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 46.3 \frac{\text{kWh}}{\text{yr}}$$

## 23 Watt CFLs

For estimating the unitary savings value for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the actual wattage of the CFLs (23 W) and the average wattage of the incandescent lamps typically replaced with such CFLs. Based on the data collected through the Efficient Products – Direct Install program for residential buildings, Econoler estimated that old incandescent lamps replaced with 23 watt CFLs have an average wattage of 93.5 W. This value is consistent to what is found on the market. In fact, according to the ENERGY STAR light output equivalency table, 23 watt CFLs are comparable to 75 or 100 watt incandescent lamps. However, incandescent lamps of 75 watts are rarely available on the market and manufacturers indicate more often that the light output of a 23 watt CFL is sufficient to replace a 100 watt incandescent lamp. Thus, Econoler considers adequate using an average replaced wattage of 93.5 W resulting in an average displaced wattage of 70.5 W.

As for 13 watt CFLs, the daily usage of 23 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

The review resulted in a unitary savings value for 23 watt CFLs of 69.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

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<sup>4</sup> Econoler, "Evaluation Report: Programme Produits Mieux Consommer – Éclairage résidentiel," presented to Hydro-Québec, Quebec, March 30, 2011.

#### 4.2.2 CFL Torchieres

CFL torchieres were installed through the Clean Nova Scotia New Waterford pilot project. The unitary savings for this product are estimated at 241 kWh by ENSC, based on the Navigant study mentioned earlier. The assumptions used to estimate this value were not available. Therefore, Econoler based its review on other studies and assumptions.

The average displaced wattage was estimated by calculating the difference between the average wattage of CFL torchieres installed through the pilot project (23 W) and the average equivalent wattage of the replaced incandescent lamps, using the same value as for 23 watt CFLs; i.e., 93.5 W. Thus, the average displaced wattage is 70.5 watts.

For the hours of operation, Econoler uses the same daily usage of 2.7 hours, as is the case with CFLs.

Using these assumptions, the annual unitary savings value for CFL torchieres is calculated based on the equation below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

Therefore, the unitary savings estimation of 241 kWh will be adjusted to 69.5 kWh.

#### 4.2.3 LED Nightlights

LED nightlights were installed through both the Clean Nova Scotia New Waterford and Nedco Homeowner pilot projects. Based on a technical reference manual from the Pennsylvania Public Utility Commission<sup>5</sup>, ENSC estimates a unitary savings value of 26 kWh for the installation of LED nightlights. The assumptions behind this savings calculation are presented in the table below.

**Table 18: Unitary Savings Estimation for LED Nightlights**

| Parameters                             | Values        |
|----------------------------------------|---------------|
| Old Wattage (incandescent nightlights) | 7 W           |
| New Wattage (LED nightlights)          | 1 W           |
| Average Displaced Wattage              | 6 W           |
| Operating Time                         | 12 h/day      |
| <b>Annual Savings</b>                  | <b>26 kWh</b> |

<sup>5</sup> Pennsylvania Public Utility Commission, "Technical Reference Manual," Pennsylvania, June 2011.

As with the LIR program, Econoler considered a wattage value of 0.3 W for the LED nightlights installed under the pilot projects. They are used to replace old nightlights which are traditionally made of a 7 W incandescent light. Such replacement results in an average displaced wattage of 6.7 W, which is used by Econoler for this evaluation.

The 12-hour/day operation time used by the Pennsylvania Public Utility Commission represents a nightlight that is turned on all night. Econoler could not find any other jurisdiction to support this value. However, the Evaluator considers that the 12-hour value is adequate. The LED nightlights installed are equipped with a sensor that automatically turns on the nightlight when it is dark. Therefore, the nightlights installed in rooms that are not affected by daylight are likely to remain on for several hours during the day. For nightlights installed in rooms affected by daylight, there is a potential operating time of 11.8 hours per day since the average time of illumination in Halifax is 12.2 hours per day<sup>6</sup>. Another element justifying the operating time of 12 hours lies in the fact that on-site visits conducted for the LIR program revealed an average usage of 11.8 hours a day, based on participant declarations.

Using a displaced wattage of 6.7 W and an average operating time of 12 hours a day, Econoler calculated a unitary savings value of 29.3 kWh. This value is used in the gross savings calculations for the LED nightlights.

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<sup>6</sup> National Research Council Canada, Sunrise/Sunset Calculator, Standard times of solar rise for Halifax, Nova Scotia, 2011, [www.nrc-cnrc.gc.ca](http://www.nrc-cnrc.gc.ca).

#### 4.2.4 Programmable Thermostats

Programmable thermostats were installed through the Nedco Homeowner pilot project. For this product, ENSC uses a unitary savings value of 63.15 kWh per year. This value comes from the OPA report. The baseline corresponds to a standard electronic thermostat. As a result, the energy savings are calculated from the temperature set back that can be set at night with a programmable thermostat. To do so, the OPA considered a savings value of 1 percent for every degree set back<sup>7</sup>.

For the Retail Markdown Program (RMP) evaluation, Econoler reviewed another study to adjust the unitary savings value used for programmable thermostats. The 2009 evaluation of Hydro-Québec's Residential Electronic Thermostats in New Construction program<sup>8</sup> estimated the energy savings generated by the thermostat accuracy and by the temperature set back. The table below presents the results of this evaluation.

**Table 19: Main Outputs from Hydro-Québec's Evaluation of Electronic Thermostat Savings**

| Calculation Parameters                                                               | Housing Type    |                                 |           |
|--------------------------------------------------------------------------------------|-----------------|---------------------------------|-----------|
|                                                                                      | Single-Detached | Duplex / Triplex /<br>Townhouse | Apartment |
| <b>Gross Energy Savings for Electronic Thermostat Accuracy</b>                       |                 |                                 |           |
| Percentage of savings due to the thermostat accuracy                                 | 9.0%            | 5.5%                            | 4.5%      |
| Annual consumption for electric space heating (before thermostat installation) [kWh] | 12,542          | 7,734                           | 4,782     |
| Savings per house [kWh]                                                              | 1,129           | 425                             | 215       |
| Number of thermostats per house                                                      | 9.36            | 4.52                            | 3.55      |
| Savings per thermostat [kWh]                                                         | 121             | 94                              | 61        |
| <b>Gross Energy Savings for Temperature Set Back with Programmable Thermostats</b>   |                 |                                 |           |
| Savings per housing [kWh]                                                            | 434             | 333                             | 225       |
| Number of programmable thermostats per house                                         | 4.33            | 1.66                            | 1.91      |
| Savings per thermostat [kWh]                                                         | 100             | 201                             | 118       |

<sup>7</sup> U.S. Department of Energy, Energy Savers – Thermostats and Control Systems, [www.energysavers.gov](http://www.energysavers.gov), last update: 2011-09-02.

<sup>8</sup> Econoler, "Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel," Final Report presented to Hydro-Québec, February 9, 2009.

For the savings calculation due to the electronic thermostat accuracy, the percentages of savings were based on research supervised by Hydro-Québec's laboratory of energy technologies (LTE)<sup>9</sup>. The research used results from tests conducted in LTE environmental chambers and in single-family homes by comparing the operation of bimetallic thermostats versus electronic thermostats and the consumption of houses with bimetallic thermostats versus electronic thermostats. The annual consumption for electric space heating was estimated through a billing analysis including 25,703 clients and 206,861 billing periods.

For the savings calculation due to the temperature set back, the savings per house resulted from a billing analysis regression which compared the consumption of houses with electronic thermostats and houses with programmable thermostats.

As the unitary savings value of 63.15 kWh currently used by ENSC is a theoretical value based on an engineering calculation, Econoler considers more adequate to use the results from LTE tests conducted in environmental chambers and in single-family homes as well as the billing analysis from Hydro-Québec's evaluation report. Moreover, it includes the savings due to the higher level of accuracy obtained from the replacement of an old bimetallic thermostat with an electronic model. Since the field data from the Efficient Products – Direct Install program shows that the baseline in Nova Scotia should be established as bimetallic thermostats, Econoler considers that these savings should be added to the temperature set back savings.

The Nedco Homeowner pilot project was targeted at the residential sector. Econoler calculated an average unitary savings value based on the proportion of housing types in Nova Scotia's residential market.

**Table 20: Unitary Savings Estimation for Programmable Thermostats**

| Calculation Parameters                                                      | Housing Type    |                              |           |
|-----------------------------------------------------------------------------|-----------------|------------------------------|-----------|
|                                                                             | Single-Detached | Duplex / Triplex / Townhouse | Apartment |
| Proportion of housing type                                                  | 76%             | 11%                          | 13%       |
| Gross Energy Savings for Electronic Thermostat Accuracy                     |                 |                              |           |
| Savings per thermostat [kWh]                                                | 121             | 94                           | 61        |
| Average savings per thermostat [kWh]                                        | 110             |                              |           |
| Gross Energy Savings for Temperature Set Back with Programmable Thermostats |                 |                              |           |
| Savings per thermostat [kWh]                                                | 100             | 201                          | 118       |
| Average savings per thermostat [kWh]                                        | 113             |                              |           |

<sup>9</sup> Hydro-Québec – Laboratoire des technologies de l'énergie (LTE), Sommaire exécutif de rapports publiés par Hydro-Québec concernant les économies d'énergie dues aux thermostats électroniques, October 2004.

Thus, the total unitary savings value associated with the installation of a programmable thermostat through the Nedco Homeowner pilot project is equal to 223 kWh per year.

#### 4.2.5 Electric Kettles

Electric kettles were installed through the Clean Nova Scotia New Waterford pilot project. For this product, ENSC uses a unitary savings value of 49 kWh, based on the Navigant study for which the calculation details were not available. This value was used in previous evaluations of the Low Income Homeowner program. Since Econoler was unable to find secondary information on energy savings estimations for electric kettles, the unitary savings value of 49 kWh per year was maintained for this year's evaluation. The same value is used in this year's evaluation of the Low Income program.

#### 4.2.6 Faucet Aerators

ENSC uses a unitary savings value of 86 kWh for faucet aerators, based on the Navigant study. However, the assumptions used to estimate this value were not available, so Econoler used other studies and assumptions to conduct its revision.

To do so, Econoler reviewed two studies estimating the annual unitary savings value for the installation of faucet aerators.

**Table 21: Unitary Savings Estimate for Faucet Aerators from Other Jurisdictions**

| Annual Unitary Savings | Source                                             |
|------------------------|----------------------------------------------------|
| 176.3 kWh              | OPA                                                |
| 159.1 kWh              | Wisconsin Focus on Energy Evaluation <sup>10</sup> |

The annual unitary savings value presented in the table above is an average savings value per faucet, calculated from three faucets, one installed in the kitchen and two in the bathrooms. Both studies used a base flow rate of 2.2 gpm reduced by 31.8 percent to 1.5 gpm, which is appropriate. The narrow gap between both values is mainly due to a difference between the average hot water usage assumptions.

Econoler decided to use the OPA unitary savings since a comparison with a Canadian province is more appropriate and because many unitary savings from the OPA are already deemed acceptable

<sup>10</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.



for most products promoted through ENSC programs. Therefore, the unitary savings value that will be used in the current evaluation is 176.3 kWh per year.

#### 4.2.7 Low-Flow Showerheads

For low-flow showerheads, ENSC uses a unitary savings value of 157 kWh. This savings value is based on the Navigant study for which the calculation details were not available. Therefore, Econoler used other sources of data to review the unitary savings generated by the installation of low-flow showerheads. In the OPA report, the annual savings for low-flow showerheads are calculated using the assumptions below.

**Table 22: OPA Unitary Savings Estimate for Low-Flow Showerheads**

| Parameters                                  | Values                       |
|---------------------------------------------|------------------------------|
| Typical Flow Rate for a Low-Flow Showerhead | 4.73 L/min (1.25 gpm)        |
| Average Flow Rate for a Regular Showerhead  | 7.57 L/min (2.0 gpm)         |
| Average Amount of Showers Taken             | 2.3 showers/day/household    |
| Average Showering Time                      | 7.5 minutes                  |
| Average Shower Temperature                  | 40°C (104°F)                 |
| <b>Annual Savings</b>                       | <b>377 kWh per household</b> |

Econoler considers these parameters reliable and conservative. On its website, Natural Resources Canada (NRCAN) promotes the installation of low-flow showerheads<sup>11</sup>. NRCAN specifies that these showerheads range from as low as 3.8 litres per minute to 9.5 litres per minute, with the most common around five litres per minute. This value is close to what the OPA uses in its assumption for a typical low-flow showerhead rate. Using its assumptions, NRCAN calculates an annual savings value of 377 kWh per household, similar to the OPA's value.

Finally, since the number of showerheads installed through the program is always one unit per household, this annual savings value can be used as a unitary savings value per low-flow showerhead.

<sup>11</sup> Natural Resources Canada, Personal: Residential – Better Water Use Means Bigger Savings, [www.oee.nrcan.gc.ca](http://www.oee.nrcan.gc.ca), date modified: 2009-06-26.

#### **4.2.8 Pipe Insulation**

The Clean Nova Scotia New Waterford and Nedco Homeowner pilot projects proposed the installation of water heater pipe insulation for households where the domestic hot water is heated electrically. For this product, ENSC uses a unitary savings value of 74 kWh per year per 10-feet of insulated pipe, based on the 2009 impact evaluation report of the Low Income Homeowner program. Initially, the annual savings value used by ENSC assumed that pipe insulation was installed on a 1.5-inch pipe. In 2009, the evaluation revised the savings value to use a 0.75-inch pipe, which was considered as more common in residential applications. Econoler maintained this unitary savings value of 74 kWh per year since it is consistent with the insulated pipe size found in the OPA report.

#### **4.2.9 Hot Water Tank Wraps**

Hot water tank wraps were installed in houses where the domestic hot water is heated electrically through the two additional pilot projects. For this product, ENSC uses a unitary savings value of 399 kWh per year. This savings value is based on the 2009 impact evaluation report of the Low Income Homeowner program.

As a second source, Econoler consulted the OPA report. The 2011 version of the report looked into the installation of water heater blankets in the residential market.

The annual unitary savings for both single- and multi-family households were estimated at 270 kWh. Since the assumptions used by the OPA to estimate this unitary savings value are clear, well documented and reliable, Econoler used the unitary savings value of 270 kWh per year for this evaluation.

#### 4.2.10 Power Bars with Integrated Timer

Based on the OPA report, ENSC uses a unitary savings value of 53 kWh for the installation of power bars with integrated timer. This product helps reduce the standby energy use of the electronic devices plugged into it. The OPA calculates the annual savings for this product using a weighted average of the savings generated for each group of electric devices that can be plugged into a power bar.

**Table 23: OPA Unitary Savings Estimate for Power Bars with Integrated Timer**

| Parameters                      | Entertainment Centres | Computer Systems | Lighting   | Others     |
|---------------------------------|-----------------------|------------------|------------|------------|
| Proportion                      | 40.3%                 | 15.7%            | 19.4%      | 24.6%      |
| Average Wattage                 | 38.1 W                | 28 W             | 60 W       | 28 W       |
| Old Operating Time              | 9 h/day               | 14 h/day         | 6 h/day    | 11 h/day   |
| New Operating Time – with Timer | 5 h/day               | 8 h/day          | 3 h/day    | 4 h/day    |
| Operating Season                | 12 months             | 12 months        | 8.5 months | 8.6 months |
| <b>Annual Savings</b>           | <b>53.09 kWh</b>      |                  |            |            |

Econoler considers these assumptions acceptable. The on-site visits revealed that the power bars with integrated timer are mainly installed on entertainment centre devices (3 out of 5) and on computer systems (2 out of 5), which confirms the proportions used for this electronic device. Therefore, Econoler has continued using the unitary savings value of 53 kWh per year for the power bars with integrated timer installed through the MURR program.

#### 4.2.11 Appliance Retirement

The MURR program included an appliance retirement component which targeted two specific products: room air conditioner units and dehumidifiers. Only one dehumidifier was retired through the MURR program in 2011 and is claimed in the Efficient Products – Appliance Retirement program.

#### 4.2.12 Installation Rate

The MURR program proposes direct installation of various products. For different reasons, it is possible for a participant to decide to remove a product after its installation. The on-site visits were used to verify the phenomenon of product removal.

For each site, the number of products installed was validated on site and compared to the number indicated in the program tracking sheet. When the number of products found on site was different from the number in the tracking sheet, the ratio between both numbers was calculated to establish the percentage of products installed.

For power bars with integrated timer, the percentage of products installed was measured by verifying if the end-users were using the timer. This timer is specific to an energy-efficient power bar, and not using it prevents the reduction of standby power and thus the achievement of savings.

As mentioned earlier, the sampling was limited to the fact that only a few numbers of faucet aerators and low-flow showerheads had been installed through the program. Therefore, it was only possible to measure the installation percentage of CFLs and power bars with integrated timer, which were installed in all dwellings visited. Since it was not possible to validate the installation rate for faucet aerators and low-flow showerheads, it is assumed to be 100 percent.

The table below presents the installation rate calculated from the five on-site visits conducted under the framework of this evaluation.

**Table 24: Percentage of Products Installed and Installation Rate**

| Category of Products  | Tracking Sheet – Number Installed | On-Site Visits – Number Installed | Percentage of Products Installed | Installation Rate % |
|-----------------------|-----------------------------------|-----------------------------------|----------------------------------|---------------------|
| CFLs                  | 43                                | 43                                | 100%                             | 100%                |
| Faucet Aerators       | N/A                               | N/A                               | 100%                             | 100%                |
| Low-Flow Showerheads  | N/A                               | N/A                               | 100%                             | 100%                |
| Power Bars with Timer | 5                                 | 2                                 | 40%                              | 100%                |

A low percentage of products installed was found for power bars with integrated timer as only two of five multi-unit renters are using the timer. The same phenomenon was noticed in the LIR program. The timer connected to the energy-efficient power bar is responsible for the energy savings generated from the installation of such product. Not using it is like using a standard power bar. This issue could be addressed in the future by giving more information to participants on how to use the timer on the power bar. To maintain measure sustainability, participants need to understand the necessity of using the timer to benefit from the energy savings.

The on-site visits were scheduled mainly for quality assurance. For this year's evaluation, the precision level obtained with the five sites visited was not sufficient to establish an installation rate that applied to all the power bars with integrated timer installed through the program. Therefore, an installation rate of 100 percent was used. However, since a significant number of sites visited did not use the timer with their

power bar, Econoler recommends increasing the number of on-site visits for the next evaluation. That way, the Evaluator would be able to establish an installation rate with a reasonable margin error and to validate if the problem could have been solved by giving more information to participants on how to use the timer on the power bar.

#### **4.2.13 Energy-to-Demand Ratio**

Econoler calculated the demand savings for the MURR program based on an energy-to-demand ratio of 6.27 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings by the target peak demand savings.

#### **4.2.14 Revised Gross Savings**

The annual gross savings for each category of products installed through the MURR program as well as the two additional pilot projects are presented in Table 25. They were calculated using the revised unitary savings established in the previous section. It is important to note that savings for pipe insulation and hot water tank wraps are only claimed for households where water is heated electrically. For the Clean Nova Scotia New Waterford pilot project, pipe insulation and hot water tank wraps are also offered to households where water is not heated electrically but, in these cases, the product installations are paid by the Province.

Overall, the total gross energy and demand savings amount to 0.817 GWh and 0.130 MW at the meter.

The gross savings at generator level are also estimated in Table 25, using a line loss factor between the meter and the generator of 1.1043. This value was estimated for the LIR program, using the participants' rate code. Both the LIR and the MURR programs target renters in multi-unit buildings, which include commercial customers (building with one meter for all renters) and residential customers (meter for each renter). Since the information on rate codes was not collected for the MURR program, Econoler assumed that the proportion of residential (88%) and commercial (12%) customers in the low-income renter market was similar to that found in the multi-unit renter market.

Total gross energy and demand savings correspond to 0.903 GWh and 0.144 MW at the generator.

**Table 25: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                       | 13 Watt CFLs | 23 Watt CFLs | CFL Torchieres | LED Nightlights | Programmable Thermostats | Electric Kettles | Faucet Aerators | Low-Flow Showerheads | Power Bars with Timer | Pipe Insulation | Hot Water Tank Wraps |
|--------------------------------------------------------|--------------|--------------|----------------|-----------------|--------------------------|------------------|-----------------|----------------------|-----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                  |              |              |                |                 |                          |                  |                 |                      |                       |                 |                      |
| Number of units from MURR tracking sheet               | 2,052        | 544          | -              | -               | -                        | -                | 53              | 60                   | 272                   | -               | -                    |
| Number of units from Clean NS New Waterford pilot      | 5,879        | 336          | 8              | 373             | -                        | 128              | 453             | 198                  | -                     | 197             | 229                  |
| Number of units from Nedco Homeowner pilot             | 944          | 131          | 0              | 0               | 67                       | -                | 18              | 45                   | -                     | 6               | 21                   |
| Total number of units                                  | <b>8,875</b> | <b>1,011</b> | <b>8</b>       | <b>373</b>      | <b>67</b>                | <b>128</b>       | <b>524</b>      | <b>303</b>           | <b>272</b>            | <b>203</b>      | <b>250</b>           |
| Installation rate                                      | 100%         | 100%         | -              | -               | -                        | -                | 100%            | 100%                 | 100%                  | -               | -                    |
| Total number of units installed                        | 8,875        | 1,011        | 8              | 373             | 67                       | 128              | 524             | 303                  | 272                   | 203             | 250                  |
| Unitary savings (kWh)                                  | 46.3         | 69.5         | 69.5           | 29.3            | 223                      | 49               | 176.3           | 377                  | 53                    | 74              | 270                  |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>0.411</b> | <b>0.070</b> | <b>0.0006</b>  | <b>0.011</b>    | <b>0.015</b>             | <b>0.006</b>     | <b>0.092</b>    | <b>0.114</b>         | <b>0.014</b>          | <b>0.015</b>    | <b>0.068</b>         |
| Line loss factor                                       | 1.1043       | 1.1043       | 1.1043         | 1.1043          | 1.1043                   | 1.1043           | 1.1043          | 1.1043               | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>0.454</b> | <b>0.078</b> | <b>0.0006</b>  | <b>0.012</b>    | <b>0.016</b>             | <b>0.007</b>     | <b>0.102</b>    | <b>0.126</b>         | <b>0.016</b>          | <b>0.017</b>    | <b>0.075</b>         |
| <b>Demand Savings</b>                                  |              |              |                |                 |                          |                  |                 |                      |                       |                 |                      |
| Energy-to-demand ratio                                 | 6.27         | 6.27         | 6.27           | 6.27            | 6.27                     | 6.27             | 6.27            | 6.27                 | 6.27                  | 6.27            | 6.27                 |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.066</b> | <b>0.011</b> | <b>0.0001</b>  | <b>0.002</b>    | <b>0.002</b>             | <b>0.001</b>     | <b>0.015</b>    | <b>0.018</b>         | <b>0.002</b>          | <b>0.002</b>    | <b>0.011</b>         |
| Line loss factor                                       | 1.1043       | 1.1043       | 1.1043         | 1.1043          | 1.1043                   | 1.1043           | 1.1043          | 1.1043               | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.072</b> | <b>0.012</b> | <b>0.0001</b>  | <b>0.002</b>    | <b>0.003</b>             | <b>0.001</b>     | <b>0.016</b>    | <b>0.020</b>         | <b>0.003</b>          | <b>0.003</b>    | <b>0.012</b>         |

### 4.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the MURR program, replacement of lighting products with CFLs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, a CFL releases less heat than the less efficient lamp it replaces.

For CFLs installed through the MURR program and for lighting products (CFLs, CFL torchieres and LED nightlights) installed through the two additional pilot projects, an interactive effects factor of -18.5 percent is used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work carried out in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2 software<sup>12</sup> and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high interactive effects. The scenario with minimum interactive effects was finally selected for the calculation. It enabled to account for the evolution of homes since 1992.

The table below presents the calculation details of the interactive effects for CFLs. It reflects the proportion of residences in Nova Scotia that are heated electrically<sup>13</sup> and those that use air conditioning units or systems<sup>14</sup>.

**Table 26: Interactive Effects Factor for CFLs, CFL Torchieres and LED Nightlights**

| Parameters                                   | % of Residences             | Interactive Effects <sup>15</sup> |
|----------------------------------------------|-----------------------------|-----------------------------------|
| Electric heating with air conditioning       | $33\% \times 18\% = 5.9\%$  | -54.4%                            |
| Electric heating without air conditioning    | $33\% \times 82\% = 27.1\%$ | -58.0%                            |
| No electric heating with air conditioning    | $67\% \times 18\% = 12.1\%$ | 3.6%                              |
| No electric heating without air conditioning | $67\% \times 82\% = 54.9\%$ | 0%                                |
| <b>Weighted Interactive Effects Factor</b>   | -                           | <b>-18.5%</b>                     |

<sup>12</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>13</sup> ENSC from socket study.

<sup>14</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

<sup>15</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

For pipe insulation and hot water tank wraps installed through the New Waterford and Nedco Homeowner pilot projects, interactive effects of -100 percent are considered during the heating period in electrically heated houses. This estimation is based on the fact that, when there is no insulation, all the heat lost through the pipes and the hot water tank is released into the room. Assuming that the pipes and tank are located in a heated room, it means that 100 percent of the energy released from the hot water is used for the heating load. Conversely, during the cooling period, interactive effects are estimated at +100 percent in houses that use air conditioning. Based on the heating and cooling degree-days for the region of Halifax<sup>16</sup>, Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation. The table below presents the details for such calculation. As for lighting products, the table shows the proportion of residences in Nova Scotia that are heated electrically and those that use air conditioning units or systems, which results in a weighted interactive effects factor of -19.0 percent.

**Table 27: Interactive Effects Factor for Pipe Insulation and Hot Water Tank Wraps**

| Parameters                                   | % of Residences             | Interactive Effects During Heating Period | Interactive Effects During Cooling Period |
|----------------------------------------------|-----------------------------|-------------------------------------------|-------------------------------------------|
| Electric heating with air conditioning       | $33\% \times 18\% = 5.9\%$  | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric heating without air conditioning    | $33\% \times 82\% = 27.1\%$ | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| No electric heating with air conditioning    | $67\% \times 18\% = 12.1\%$ | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No electric heating without air conditioning | $67\% \times 82\% = 54.9\%$ | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                 | <b>-22.1%</b>                             | <b>+3.1%</b>                              |
|                                              |                             | <b>-19.0%</b>                             |                                           |

For all other products, interactive effects are considered as negligible.

<sup>16</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.



## **4.4 NET-TO-GROSS RATIO**

The net-to-gross ratio (NTGR) is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on multi-unit renters' decisions to participate in the program. This section presents the methodology used to transform information obtained through the participant survey into a NTGR. For the MURR program, the NTGR includes the assessment of two distortion effects: free-ridership and spillover. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ spillover})$$

### **Free-Ridership**

The free-ridership level is measured using the participant survey conducted with multi-unit renters who had energy-efficient products installed. The questionnaire included five free-ridership questions that attempted to assess:

- > if participants had any plans to install energy-efficient products before learning about the program;
- > the probability that participants would have installed the same energy-efficient products if they had not participated in the program;
- > the probability that participants would have installed the same energy-efficient products but at a later date if they had not participated in the program; and
- > if participants would have paid the full cost of the energy-efficient products if the program had not been in place.

Each question was transposed into a level of program attribution which is used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix VIII.

Econoler's approach to estimating free-ridership is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania by using:

- > A 0 to 10 scoring system.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced customer energy efficiency decision making. This question structure more accurately reflects the complex nature of real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Using this approach, survey results reveal a free-ridership level of 17 percent for MURR program participants. The fact that the MURR program was new this year and was targeting multi-unit renters, which often represent customers that are less interested in energy efficiency, explains this low level of free-ridership.

This result is in line with the survey results presented in Table 11. Participants declared that the free installation of energy-efficient products was very important in their decision to participate in the program and install energy-efficient products in their homes. Survey results also reveal that most participants would not have installed any or some of the energy-efficient products in the absence of the program, which proves to ENSC the necessity to continue targeting multi-unit customers. However, results varied between the products. For instance, when participants were asked if they had any plans to install power bars with integrated timer before learning about the program, 96 percent said that they did not. For CFLs, only 45 percent of participants declared that they did not have any plans to install CFLs before learning about the program and 35 percent said that they would not have paid the full cost of the CFLs if the program had not been in place. Globally, the average free-ridership level remained low, calculated at 17 percent for all the products installed through the MURR program.

## **Internal Spillover**

The internal spillover effects of the program are measured through the participant survey. Internal spillover can occur when participants purchase eligible energy-efficient products following their previous participation in the program because of its influence, thereby demonstrating the advantages of such products.

During the telephone survey, participants were asked if they had bought and installed additional energy-efficient products following their previous participation in the program. An additional question was used to verify the eligibility of the additional purchases by asking if they had benefited from any other incentive program for these additional purchases.

Subsequently, other questions were asked to verify the level of influence the program had on the purchases. Depending on the level of influence obtained during the survey, a portion of the savings related to the additional purchase was attributed to the program.

The level of internal spillover was calculated for each participant, according to the equation below. The energy savings (kWh) associated with the additional purchases are estimated using the unitary savings value revised in this evaluation.

$$\%SO = \frac{kWh \text{ associated with the additional purchase} \times \text{attribution level}}{kWh \text{ associated with the products installed under the program}}$$

Only one participant declared having purchased additional energy-efficient products following his previous participation in the program. More precisely, the participant declared having purchased additional CFLs and estimated that the program had had an influence of 70 percent on his purchase. Therefore, the energy savings associated with the additional purchases of energy-efficient products attributable to the program corresponded to very small energy savings. When compared to the total savings generated by survey respondents through the program, it represented an extremely low spillover level, below one percent. The internal spillover level for the MURR program is considered to be null.

Due to the targeted market, the level of internal spillover for this program was expected to be low. In fact, renters often show less interest in energy efficiency because they do not want to install products in homes they do not own and where, for some, they are not even in charge of the electricity bill. Moreover, the absence of spillover can be explained by the fact that a direct install program covers a lot of potential energy efficiency measures that can be achieved in a home, leaving fewer opportunities for additional measures.

Using the free-ridership level established, the NTGR value for the program is 0.83.

This NTGR is also applied to the gross savings generated by the two additional pilot projects. Econoler considers that this approach is adequate since the pilot projects present several similarities with the MURR program; i.e., the typical energy-efficient products installed, the direct install approach and the targeted customers.

## **4.5 NET SAVINGS**

Net energy savings are estimated by adding the interactive effects and the NTGR to the gross energy savings, based on the equation below.

$$\text{Net Energy Savings} = \text{Gross Energy Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

The net energy savings were first calculated separately for each product because the interactive effects differed from one product to another. Table 28 presents the details of the calculation.

Overall, total net energy and demand savings amount to 0.590 GWh and 0.094 MW at the meter, and 0.651 GWh and 0.104 MW at the generator.

**Table 28: Evaluation Results –Net Energy and Demand Savings**

| Product Category                                     | 13 Watt CFLs | 23 Watt CFLs | 23 Watt CFL Torchieres | LED Nightlights | Programmable Thermostats | Electric Kettles | Faucet Aerators | Low-Flow Showerheads | Power Bars with Timer | Pipe Insulation | Hot Water Tank Wraps |
|------------------------------------------------------|--------------|--------------|------------------------|-----------------|--------------------------|------------------|-----------------|----------------------|-----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                |              |              |                        |                 |                          |                  |                 |                      |                       |                 |                      |
| Total Gross Energy Savings – at Meter (GWh)          | 0.411        | 0.070        | 0.0006                 | 0.011           | 0.015                    | 0.006            | 0.092           | 0.114                | 0.014                 | 0.015           | 0.068                |
| Interactive effects                                  | -18.5%       | -18.5%       | -18.5%                 | -18.5%          | 0%                       | 0%               | 0%              | 0%                   | 0%                    | -19.0%          | -19.0%               |
| NTGR                                                 | 0.83         | 0.83         | 0.83                   | 0.83            | 0.83                     | 0.83             | 0.83            | 0.83                 | 0.83                  | 0.83            | 0.83                 |
| <b>Total Net Energy Savings (GWh) – at Meter</b>     | <b>0.278</b> | <b>0.048</b> | <b>0.0004</b>          | <b>0.007</b>    | <b>0.012</b>             | <b>0.005</b>     | <b>0.077</b>    | <b>0.095</b>         | <b>0.012</b>          | <b>0.010</b>    | <b>0.045</b>         |
| Line loss factor                                     | 1.1043       | 1.1043       | 1.1043                 | 1.1043          | 1.1043                   | 1.1043           | 1.1043          | 1.1043               | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Net Energy Savings (GWh) – at Generator</b> | <b>0.307</b> | <b>0.052</b> | <b>0.0004</b>          | <b>0.008</b>    | <b>0.014</b>             | <b>0.006</b>     | <b>0.085</b>    | <b>0.105</b>         | <b>0.013</b>          | <b>0.011</b>    | <b>0.050</b>         |
| <b>Demand Savings</b>                                |              |              |                        |                 |                          |                  |                 |                      |                       |                 |                      |
| Total Gross Demand Savings – at Meter (MW)           | 0.066        | 0.011        | 0.0001                 | 0.002           | 0.002                    | 0.001            | 0.015           | 0.018                | 0.002                 | 0.002           | 0.011                |
| Interactive effects                                  | -18.5%       | -18.5%       | -18.5%                 | -18.5%          | 0%                       | 0%               | 0%              | 0%                   | 0%                    | -19.0%          | -19.0%               |
| NTGR                                                 | 0.83         | 0.83         | 0.83                   | 0.83            | 0.83                     | 0.83             | 0.83            | 0.83                 | 0.83                  | 0.83            | 0.83                 |
| <b>Total Net Demand Savings (MW) – at Meter</b>      | <b>0.044</b> | <b>0.008</b> | <b>0.0001</b>          | <b>0.001</b>    | <b>0.002</b>             | <b>0.001</b>     | <b>0.012</b>    | <b>0.015</b>         | <b>0.002</b>          | <b>0.002</b>    | <b>0.007</b>         |
| Line loss factor                                     | 1.1043       | 1.1043       | 1.1043                 | 1.1043          | 1.1043                   | 1.1043           | 1.1043          | 1.1043               | 1.1043                | 1.1043          | 1.1043               |
| <b>Total Net Demand Savings (MW) – at Generator</b>  | <b>0.049</b> | <b>0.008</b> | <b>0.0001</b>          | <b>0.001</b>    | <b>0.002</b>             | <b>0.001</b>     | <b>0.014</b>    | <b>0.017</b>         | <b>0.002</b>          | <b>0.002</b>    | <b>0.008</b>         |

The energy savings resulting from this evaluation were compared to the energy savings from the tracking sheet. The net savings from the evaluation results and the tracking sheet presented in the table below include the savings from the MURR program and the two additional pilot projects.

**Table 29: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Installed Gross Savings</b> | <b>Installed Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------------------------|---------------------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked savings from ENSC | 0.725 GWh                    | 0.725 GWh                      | 0.725 GWh                                               | 0.85        | 0.616 GWh          |
| <b>Evaluation results</b> | <b>0.903 GWh</b>             | <b>0.903 GWh</b>               | <b>0.785 GWh</b>                                        | <b>0.83</b> | <b>0.651 GWh</b>   |
| <b>Demand Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked savings from ENSC | 0.116 MW                     | 0.116 MW                       | 0.116 MW                                                | 0.85        | 0.098 MW           |
| <b>Evaluation results</b> | <b>0.144 MW</b>              | <b>0.144 MW</b>                | <b>0.125 MW</b>                                         | <b>0.83</b> | <b>0.104 MW</b>    |

Overall, the evaluation results were 6 percent higher than what was estimated by ENSC. The difference between the tracked and evaluated savings can be explained by the revision or the addition of the following parameters:

- > Unitary savings values: For several products, the unitary savings values were revised upward. The adjustment for programmable thermostats was the most important since the baseline, previously estimated as standard electronic thermostats, was reviewed to bimetallic thermostats. For faucet aerators and low-flow showerheads, the unitary savings values were also increased significantly. For 13 watt and 23 watt CFLs, the unitary savings values were increased by 13 and 25 percent respectively. Even if these adjustments are not as significant as for other products, they contributed to the realization rate because of the large number of CFLs installed through the program. On the other hand, the unitary savings values of CFL torchieres and hot water tank wraps were revised downward.
- > Interactive effects factors: Interactive effects were not taken into account in the tracking sheet. However, Econoler considers that the interactive effects on the heating and cooling loads caused by lighting product replacements, pipe insulation and hot water tank wraps are not negligible. Interactive effects factors were estimated for these products and used in the net savings calculations.
- > NTGR: There was a small difference between the evaluated NTGR of 0.83, which was estimated through the participant survey, and the NTGR of 0.85 used in the tracking sheet.

- > Line loss factor: In the tracking sheet, ENSC used a line loss factor of 1.1188, as in the 2010 evaluations for residential programs. The line loss factor for the residential sector was updated this year to 1.1043.

The revision of unitary savings values and the addition of interactive effects factors allowed for a more precise estimation of program energy and demand savings. These adjustments resulted in savings that exceeded the program estimations. This is mainly due to the upward revision of the unitary savings values for programmable thermostats, faucet aerators and low-flow showerheads.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Explain the nature of the energy audit:</b> It is recommended that ENSC designate the energy audit by its true nature (walk-through type audit) to avoid high expectations from renters and to be more specific in the description section of the program manual. It is also recommended that the audit protocol be well defined and include this definition in the program manual so that the PM and the Evaluator are both aware of it. For instance, energy-efficient products related to domestic hot water, such as low-flow showerheads and faucet aerators should only be installed in households with electric water heating.                                                                                                                                                               |
|                               | <b>2. Provide a “base case”:</b> The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                            |
|                               | <b>3. Provide the parameters used to estimate program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |
|                               | <b>4. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b> | <p><b>5. Monitor the gross savings directly in the tracking sheet:</b> The performance of the tracking sheet could be improved by adding a table with the unitary savings value estimated for each product. That way, it would be possible to indicate the unitary savings value associated with each product and to monitor program gross savings directly in the tracking sheet.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                               | <p><b>6. Establish a tracking sheet revision protocol:</b> During its review, Econoler determined that the values entered in the “Number of Incandescent Bulbs and Low-Flow Showerheads Retired” field were incorrect. This situation could be avoided simply by establishing a validation protocol that would be conducted periodically by ENSC. It would ensure that all data are correctly entered by the DA. With such a method, anomalies and missing values would be detected early on in the process.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                               | <p><b>7. Collect all necessary information for determining the eligibility of each product installed:</b> A tracking sheet should provide the PM and the Evaluator with all relevant information used to ensure that program eligibility criteria are met. Therefore, Econoler recommends separating the tracking sheet into two individual columns, one listing the number of incandescent bulbs and the other showing the number of low-flow showerheads retired through the program. Moreover, for the products related to hot water savings, e.g., low-flow showerheads and faucet aerators, Econoler suggests inserting a field that specifies the energy source used for domestic hot water heating. This way, it will be possible to confirm that product replacements have only been made where domestic hot water is electrically heated.</p>                                                                                               |
|                               | <p><b>8. Collect information for establishing base cases:</b> The PM, together with the Evaluator, should determine what fields could be added to the tracking sheet in order to collect all relevant information useful for evaluation purposes. To estimate the unitary savings value of products installed under the program, the Evaluator has to establish a base case based on the old products retired and the new products installed. For instance, in the case of lighting products, it would be useful to indicate the old lamp wattage. In the case of power bars with integrated timer, information about the group of electric devices that are plugged into the power bar could be identified in the tracking sheet. Finally, in the case of programmable thermostats installed through the Nedco Homeowner pilot project, it would be useful to indicate the type (bimetallic, electronic, etc.) of the old thermostats replaced.</p> |
|                               | <p><b>9. Collect information for establishing the line loss factor:</b> For this year’s evaluation, since the information on rate codes was not collected for the MURR program, Econoler used the value estimated for the LIR program. Should the program be conducted in the future, Econoler recommends to collect the participants’ rate codes in order to establish the line loss factor in a more precise way.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Design and Implementation</b> | <b>10. Develop an evaluation plan in parallel with program design and development:</b> When a program is launched, Econoler strongly recommends preparing an evaluation plan in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later.                                                                                                                                                                                                                                                                              |
| <b>Relation with Partners</b>            | <b>11. Modify marketing material:</b> Regarding the outreach and marketing activities, the DA feedback shows appreciation of the material and activities but leaves room for improvement. The DA suggests modifying the advertising which in some cases led tenants to believe they were required to attend a three-hour meeting and resulted in the fact that some tenants did not show up to the event. If going forward with this approach in a reconfigured program, the marketing posters should accurately describe the time commitment required from the tenants.                                                                                                                                                          |
| <b>Impact Evaluation</b>                 | <b>12. Increase the number of on-site visits:</b> A low percentage of products installed was found for power bars with integrated timer as only two of five multi-unit renters are using the timer. The same phenomenon was noticed in the LIR program. For this year's evaluation, the precision level obtained with the 5 sites visited was not sufficient to establish an installation rate to apply to all the power bars with integrated timer installed through the program. Therefore, an installation rate of 100 percent was used. However, since a significant number of sites visited did not use the timer with their power bar, Econoler recommends increasing the number of on-site visits for the next evaluation. |

## APPENDIX II - PROGRAM THEORY

| Multi-Unit Residential Renter Program                                                          |                                                                                                                                                                                                                                                             |                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                                                                                                             |                                                                                                                                                                      |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                                                                                                             |                                                                                                                                                                      |
| #                                                                                              | Program Theory                                                                                                                                                                                                                                              | Performance Indicators                                                                                                                                               |
| 1                                                                                              | One of the program objectives is to provide educational material on the efficient use of energy and its advantages. Analyzing the available educational material will allow an adequate selection for this category of customers.                           | List of educational material considered for final selection to use in the program.                                                                                   |
| 2                                                                                              | This is a three-month pilot program in three municipalities. As a result, the selection criteria should be established based on the location of the three municipalities selected under the program and based on the fact that the building is sub-metered. | Stating clearly the selection criteria for the 26 buildings. List of buildings with their addresses and other tracking information.                                  |
| 3                                                                                              | There are numerous energy-efficient products available on the market. This activity consists in analyzing the most appropriate products to consider in the program based on a series of criteria.                                                           | List of energy-efficient products to be considered for final selection to use in the program. Furthermore, list of the selection criteria or how they were selected. |
| 4                                                                                              | Specific educational material addressed to landlords and tenants will be prepared based on findings and analysis of activity #1.                                                                                                                            | Final list of educational material that will be used by the DA.                                                                                                      |
| 5                                                                                              | Among the products analyzed, a series of activities (such as a walk-through) and soft products such as power bars with timer, faucet aerators, CFL bulbs, low-flow showerheads will be selected to be installed free of charge.                             | Final list of energy-efficient products to be installed by the DA along with their deemed savings and how they were calculated.                                      |
| 6                                                                                              | Program implementation will be done through a delivery agent (Summerhill Group).                                                                                                                                                                            | Contract between ENSC and the Summerhill Group.                                                                                                                      |
| 7                                                                                              | Once the buildings are selected as well as the products, the delivery agent will proceed with program implementation.                                                                                                                                       | List of activities (educational, walk-through) and products installed and uninstalled in each apartment and building.                                                |

| <b>Multi-Unit Residential Renter Program</b>                                                          |                                                                                                                                                                                                                                                                                                                             |                                                                                  |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Program Theory and Performance Indicators</b>                                                      |                                                                                                                                                                                                                                                                                                                             |                                                                                  |
| <b>The following table explains the relationship between the different levels of the logic model.</b> |                                                                                                                                                                                                                                                                                                                             |                                                                                  |
| <b>#</b>                                                                                              | <b>Program Theory</b>                                                                                                                                                                                                                                                                                                       | <b>Performance Indicators</b>                                                    |
| 8                                                                                                     | The delivery agent will submit on a monthly basis (?) reports to the Program Manager for monitoring, evaluation and control purposes.                                                                                                                                                                                       | Same as #7 in a form that could be entered in a database such as Excel.          |
| 9                                                                                                     | The expected outcome is a reduction in the bill for whomever is responsible.                                                                                                                                                                                                                                                | Tracking deemed savings associated with each product.                            |
| 10                                                                                                    | In the medium term, one should expect an increase in EE awareness, behaviour changes towards energy use and increased comfort through the use of energy-efficient products.                                                                                                                                                 | In future evaluations, persistence of behaviour and awareness could be measured. |
| 11                                                                                                    | Finally, the most important objective is to reduce or eliminate the institutional barrier that exists between landlords and tenants about who is paying the energy bill and who should install the products or change behaviour to reduce it. This will increase demand in the rental market for energy-efficient products. | In a future evaluation window, this could be added to researchable issues.       |

## APPENDIX III - DEMOGRAPHICS

A demographic profile of program participants is derived from the following tables.

All 30 respondents rent their apartment.

**Table 30: Home Ownership**

| <b>Own or Rent</b> | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | 30          |
| Rent               | 100%        |
| Own                | 0           |

Six in 10 respondents have two bedrooms in their home (60%), while most of the remainder have just one bedroom in their home (37%).

**Table 31: Number of Bedrooms in Home**

| <b>Bedrooms</b>    | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | 30          |
| One                | 37%         |
| Two                | 60          |
| Three              | 3           |

Nearly all respondents pay the electric bill for their home (93%).

**Table 32: Pay Electric Bills for Home**

| <b>Pay Electric Bills</b> | <b>2011</b> |
|---------------------------|-------------|
| <i>Sample Size</i>        | 30          |
| Yes                       | 93%         |
| No                        | 7           |

Nearly all respondents occupy their home year round (97%).

**Table 33: Year-Round Residence**

| <b>Year-Round Residence</b> | <b>2011</b> |
|-----------------------------|-------------|
| <i>Sample Size</i>          | <i>30</i>   |
| Yes                         | 97%         |
| No                          | 73          |

Just under four in 10 have one person living in their residence (37%), while one-half have two (50%).

**Table 34: Number of People in Residence**

| <b>People in Residence</b> | <b>2011</b> |
|----------------------------|-------------|
| <i>Sample Size</i>         | <i>30</i>   |
| One                        | 37%         |
| Two                        | 50          |
| Three                      | 10          |
| Four                       | 3           |

Three in 10 respondents are aged 18 to 24 (30%), while just over two in 10 are 25 to 34 (23%).

**Table 35: Age**

| <b>Age</b>         | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>30</i>   |
| 18 to 24           | 30%         |
| 25 to 34           | 23          |
| 35 to 44           | 13          |
| 45 to 54           | 17          |
| 55 to 64           | 13          |
| 65 or over         | 3           |

Just over one-half of respondents have a college or university degree (53%).

**Table 36: Education**

| <b>Education</b>                                              | <b>2011</b> |
|---------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                            | <i>30</i>   |
| Less than high school graduation certificate                  | 7%          |
| High school graduation certificate and/or some post-secondary | 27          |
| Trades certificate or diploma                                 | 10          |
| College certificate or diploma                                | 13          |
| University degree, certificate or diploma                     | 40          |
| Don't know                                                    | 3           |

Over one-half of respondents have an annual household income of less than \$35,000 (57%).

**Table 37: Annual Household Income**

| <b>Income</b>       | <b>2011</b> |
|---------------------|-------------|
| <i>Sample Size</i>  | <i>30</i>   |
| Less than \$15,000  | 17%         |
| \$15,000 - \$24,999 | 27          |
| \$25,000 - \$34,999 | 13          |
| \$35,000 - \$49,999 | 17          |
| \$50,000 - \$69,999 | 10          |
| \$70,000 - \$79,999 | --          |
| \$80,000 or more    | 3           |
| Don't know          | 13          |

Six in 10 respondents are male (60%), while four in 10 are female (40%).

**Table 38: Gender**

| <b>Gender</b>      | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>30</i>   |
| Male               | 60%         |
| Female             | 40          |

## **APPENDIX IV - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Multi-Unit Residential Renter**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

#### **Page 45**

Q: I understand that the selection criteria are to be sub metered and located in 3 specific geographical areas. Why are you selecting sub-metered buildings?

Q: Why decide that this program will run for only 3 months (August 1<sup>st</sup> to October 31<sup>st</sup>)?

Q: I understand that the delivery agent will be Summerhill Group. Can you provide information on what is their role in this program? This will help us to ask the appropriate question in the process evaluation survey.

Q: Is there a reason why you selected 26 buildings?

C: I understand that the energy audits will more a walk-through and that the refrigerator saver thermometer had been replaced by a low flow showerhead. The last item has been subject to market transformation for a long time now. (2.5 GPM) care to comment on the choice of that product? (I believe that your item is 2.0 GPM)

Q; on what basis did you select the items to be installed?

#### **Page 46**

Q: Do you have the details or variables that were used to calculate the gross savings for each product?

**Page 47 to 54**

Q: It's not clear what is the role of these retailers in the program? Care to explain?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: is there a market study or energy savings potential study to justify this new program?

C: I haven't see a program theory, but the logic model and its table should do for now.

Q: is there a process flow chart?

Q: what distortion effects, if any were predicted in that program? to get to the net savings

Q: did you identify any particular barriers that justified the offering of that program?

Q: is there a participant form? Is it Summerhill Group that keeps the records?

Q: Do you plan to do a post evaluation cost effectiveness test?

Q: since this a new program, did you have an evaluation plan designed at the same time the program was designed?

Q: Will there be a detailed program marketing strategy with the appropriate performance indicators?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Any other subject the PM wishes to include in the process examination of the program partners and or participants.

Thank you very much for your time and cooperation.



## **APPENDIX V - INTERVIEW GUIDE WITH DELIVERY AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Multi-Unit Residential Renter**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca)

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaint from participants in the program?**

☐ Yes

**What was the complaint about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Multi-Unit Residential Renter Program**

**Q9 – Who provides you with leads for potential participants?**

**Q10- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes

If you answered Yes to Q10, which party was it?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Q11- Did you receive any complaints from other program parties?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q11a- What was the complaint about?**

**Q12 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

---

## **APPENDIX VI - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

#### **ENSC Efficient Products – Multi-Unit Residential Renter Program**

October 31, 2011

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

[INTRODUCTION]

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you recently participated in Efficiency Nova Scotia Corporation’s Multi-Unit Residential Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program.

In the Multi-Unit Residential Program, someone would have come to your house to discuss the energy efficiency of your house and to install CFL bulbs, power bars with timers, low flow showerheads or faucet aerators. Do you recall participating in this program?

- 1 Yes [CONTINUE]
- 2 No [PROMPT: “Are you sure? An event would have taken place in a common area of your building. Event representatives would have evaluated the energy efficiency of your house and installed energy-saving measures.” RECODE AS “YES” IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS NO: “Is there someone else in the household who would know about having participated in the Multi-Unit Residential Program?”]

\_\_Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

\_\_No [THANK & TERMINATE]

- 3 Don't know [PROMPT: "An event would have taken place in a common area of your building. Event representatives would have evaluated the energy efficiency of your house and installed energy-saving measures. RECODE AS "YES" IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS DON'T KNOW: "Is there someone else in the household who would know about having participated in the Multi-Unit Residential Program?"]
- \_\_\_Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]
- \_\_\_No [THANK & TERMINATE]
4. Refused [THANK AND TERMINATE]

The survey will take about fifteen minutes. Is this a good time for you?

[IF REFUSED, ASK "Can we schedule a more convenient time for you to conduct this survey?"]

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

#### **VERIFICATION AND RECALL [V series]**

- V1. Do you own or rent the premises located at [BUILDING?]
- 1. (Own)
  - 2. (Rent)
  - 98. (Don't know)
  - 99. (Refused)
- V2. Do you recall having someone come to your place and discussing the energy efficiency of your place as part of the Multi-Unit Residential Program?
- 1. Yes
  - 2. No (If No: V2a Are you sure? Someone would have come to your place and evaluated the energy efficiency of your household) CONTINUE IF STILL 'NO'
  - 98. (Don't know/Don't recall)
  - 99. (Refused)

- V3. I am going to read you a list of measures that, according to our records, were installed in your house by the program: [READ WHAT IS ON RECORD (MEASURE≠0 IN THE DATABASE)]. For each one, can you please verify that this information is correct and that the measure was installed? [1=YES, INSTALLED, 2=NO, NOT INSTALLED, 98=DON'T KNOW, 99=REFUSED]?

NOTE FOR PROGRAMMER: DO NOT PUT THE NUMBER OF EACH MEASURE

- a) CFL bulbs (**CFLs 13W – CFLs 23W**)
  - b) Low flow showerheads (**LFS**)
  - c) Faucet aerators (**Faucet Aerator**)
  - d) Power bars with timers (**Power Bar**)
- V4. [FOR EACH OF V3a to V3d = NO and RECORD = YES] Are you sure? According to our records someone would have come to your place and installed ... [READ WHAT IS ON RECORD] [1=YES → RECORD AS YES] [2=NO, 98=DON'T KNOW, 99=REFUSED → RECORD AS NO]
- V4a. [CFL bulbs]
- V4b. [Low flow showerheads]
- V4c. [Faucet aerators]
- V4d. [Power bars with timers]

**[THANKS AND TERMINATE IF RESPONDENTS SAY “NO”, “DK” OR “REF” TO ALL QUESTIONS FROM V2 TO V4]**

#### **REASONS FOR PARTICIPATING AND OVERALL PARTICIPATION [P series]**

- P1. Now I'm going to ask you to think back to when you decided to participate in the Multi-Unit Residential Program. What was the SINGLE most important reason you agreed to participate in the program?
- 1. (To save on energy costs/bills)
  - 2. (I was thinking about/planning to get energy efficient upgrades anyway)
  - 3. (To find out how energy efficient my house was/to get my house evaluated)



4. (To get expert's advice about what upgrades to get/how to make house more energy efficient)
5. (To save energy—not further specified whether for cost, environment)
6. (To help the environment)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know) (Go to P3)
99. (Refused) (Go to P3)

P2. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE RESPONSES] [SAME LIST AS IN P1 ABOVE]

P3. Before participating, did you have any concerns about taking part in the program?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

P4. [IF P3 = 1] What were those concerns? [DO NOT READ. ACCEPT ALL RESPONSES]  
PROBE: Anything else?

1. (That my house would be very inefficient)
2. (That improvements would cost a lot)
3. (That the audit wouldn't find anything / my house was too efficient)
4. (That I wouldn't like what they recommended)
5. (That I wouldn't like the products installed)
6. (The process would take too long)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

#### SATISFACTION WITH THE PROGRAM [S series]

S1. Thinking of your OVERALL experience with the Multi-Unit Residential Program, including any services or energy efficient products received and installed, how satisfied were you overall with the program on a scale from 1 to 5, where 1='not at all satisfied' and 5='very satisfied'?

[RECORD NUMBER, DO NOT ACCEPT A RANGE, 98 = Don't know, 99 = Refused]

- S2. [IF DISSATISFIED, S1 = 1 or 2] You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were dissatisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]
1. (The energy evaluation took too long)
  2. (Products installed don't suit my needs)
  3. (I expected more savings)
  4. (I don't like the light bulbs I received)
  5. (I don't like the power bars I received)
  6. (I don't like the faucet aerators installed)
  7. (I don't like the low flow showerhead installed)
  8. (I did not like the evaluator who visited the house)
  96. (Other [SPECIFY: \_\_\_\_\_])
  98. (Don't know) (Go to S4)
  99. (Refused) (Go to S4)
- S3. [IF DISSATISFIED, S1 = 1 or 2] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE] [SAME LIST AS S2 ABOVE]
- S4. Now I'm going to ask you about your experience with specific aspects of the Multi-Unit Residential Program. Using a scale from 1 to 5, where 1 means "not at all satisfied" and 5 means "very satisfied", please tell me how satisfied you are with your experience with each aspect of the program. [DO NOT RANDOMIZE. DO NOT ACCEPT A RANGE] [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused]
- a) [IF V2=1 "Yes"] The energy evaluation of your house
  - b) The energy conservation measures installed
  - c) The time required to complete work
  - d) The program representative overall
  - e) The information you received about energy efficiency or energy savings

#### SATISFACTION WITH THE IMPACT OF THE PROGRAM [SM series]

- SM1. Please indicate how, if at all, each of the following has changed since participating in the Multi-Unit Residential Program. On a scale of 1 to 5, where 1 means "no improvement" and 5 means a "considerable improvement") how much has \_\_\_\_\_ improved? [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused]
- a. Your interest in Energy efficiency
  - b. Your knowledge of Energy efficiency

SM2. [ASK IF V2= 1] Has the information you received from the energy evaluation changed your behavior in terms of how you use energy at home?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

SM3. [ASK IF SM2 = 1] How has your behavior changed? PROBE: Anything else?

[DO NOT READ. ACCEPT ALL RESPONSES]

- 1. (I turn off my lights now)
- 2. (I set my heating thermostat lower)
- 3. (I set my water heater thermostat lower)
- 4. (I hang my clothes to dry)
- 5. (I use less hot water to wash my clothes)
- 6. (I use fans instead of air conditioning)
- 7. (Close doors and windows)
- 8. (Turn off appliances)
- 96. (Other [SPECIFY \_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

#### **BARRIERS TO ACTION [B series]**

B1. [ASK IF YES TO AT LEAST ONE QUESTION FROM V3(a-d) or V4(a-d)] Were there any energy efficiency measures installed through the Multi-Unit Residential Program that you later chose to remove from your house?

- 1. Yes
- 2. No [SKIP TO B4]
- 98. (Don't know) [SKIP TO B4]
- 99. (Refused) [SKIP TO B4]

- B2. [ASK IF B1 = 1] Which measures did you choose to remove from your house? [READ ALL THAT WERE INSTALLED ‘YES’ IN V3a-d OR V4a-d]; [1 = YES, REMOVED 2 = NO, DID NOT REMOVE 98 = Don’t know, 99 = REFUSED]
- a) CFLs (compact fluorescent bulbs)
  - b) Low flow showerheads
  - c) Faucet aerators
  - d) Power bars with timers
- B3. [ASK FOR EACH MEASURE RESPONDENT CHOSE TO REMOVE (IF B2a to B2d = 1)] Why did you choose to remove [INSERT EACH ‘YES’ RESPONSE FROM B2] from your house? PROBE: Anything else? [DO NOT READ]
- 1. (Did not work like I thought it would)
  - 2. (Too complicated to use)
  - 3. (Did not like the way it looked in my space)
  - 4. (Worried that the light bulbs may cause health risks)
  - 5. (Hassle factor, too much disruption to my daily routine)
  - 6. (Did not believe any changes will result in lower energy bills)
  - 7. (Did not trust in energy professionals installing new measures)
  - 96. (Other [SPECIFY: \_\_\_\_\_])
  - 98. (Don’t know)
  - 99. (Refused)
- B4. [ASK IF VA2 = 1] Were there any energy efficiency measures recommended through the Multi-Unit Residential Program that you chose not to install or implement in your house?
- 1. Yes
  - 2. No
  - 98. (Don’t know)
  - 99. (Refused)

B5. [ASK IF B4 = 1] Why did you choose not to install or implement these energy efficiency measures in your house? PROBE: Anything else? [DO NOT READ]

1. (Too complicated to install or implement)
2. (Did not need these measures)
3. (Did not want to change, actual equipment works fine)
4. (Worried that the light bulbs may cause health risks)
5. (Did not believe any changes will result in lower energy bills)
6. (Did not trust in energy professionals installing new measures)
96. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

**INSTRUCTION:**

(FOR RESPONDENTS WITH MORE THAN TWO ("YES") MEASURES VERIFIED IN V3 AND V4, CHOOSE AT RANDOM TWO MEASURES VERIFIED. THE RESPONDENT WILL ANSWER ACCORDING TO THESE TWO MEASURES THROUGHOUT SECTION FR WHEN IDENTIFIED LIKE SO: [MEASURE 1 or 2].)

(Note: IF THERE ARE TWO MEASURES VERIFIED IN V3 AND V4, RESPONDENT WILL AUTOMATICALLY ANSWER ACCORDING TO THESE TWO MEASURES. IF THERE IS ONLY ONE MEASURE VERIFIED IN V3 AND V4, RESPONDENT WILL ANSWER ABOUT THIS UNIQUE MEASURE ONLY.)

**FREE-RIDERSHIP [FR series]**

The next questions will be about the [MEASURE 1] you had installed through the program.

FR1M1. Did you or anyone in your household have any specific plans to install [MEASURE 1] prior to talking with anyone about the Multi-Unit Residential Program?

1. Yes
2. No
98. (Don't know)
99. (Refused)

FR1aM1.**IF FR1M1=YES, THEN ASK:** I just want to make sure I understand - **Before** you decided to participate in the Multi-Unit Residential Program, you had already made the decision to install [MEASURE 1]?

1. Yes
2. No
98. (Don't know)
99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Multi-Unit Residential Program.

If you had not participated in the Multi-Unit Residential Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT. In the absence of the Program, would you have . . . DO NOT ACCEPT A RANGE – POSE FR2M1 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2aM1...installed the [MEASURE 1] that was installed through the Program?

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR2cM1 ....installed the [MEASURE 1] that was installed through the Program *but at a later date*?

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

**IF FR2cM1 > 5, then ask:**

**[DO NOT ASK IF FR2cM1=98 OR 99]**

**FR2ccM1.** You indicated in your previous response that if the Multi-Unit Residential program had not been available there was an [FR2cM1] in 10 likelihood that you would have installed the same energy-efficient products *but at a later date*. Approximately how many months later would you have installed these products? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't know)
99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2ccM1 ANSWER IN MONTHS, READ:**

Would it have been within . . .

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3M1. If Efficiency Nova Scotia had not installed [MEASURE 1] for free, would you have paid the full cost of the [MEASURE 1]?

1. Yes
2. No
97. (Depends on the cost)
98. (Don't know)
99. (Refused)

**[IF ONLY ONE MEASURE VERIFIED IN V3-V4, SKIP TO FR4]**

The next questions will be about the [MEASURE 2] you had installed through the program.

FR1M2. Did you or anyone in your household have any specific plans to install [MEASURE 2] prior to talking with anyone about the Multi-Unit Residential Program?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

**FR1aM2. IF FR1M2=YES, THEN ASK:** I just want to make sure I understand - **Before** you decided to participate in the Multi-Unit Residential Program, you had already made the decision to install [MEASURE 2]?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Multi-Unit Residential Program.

If you had not participated in the Multi-Unit Residential Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT. In the absence of the Program, would you have . . . DO NOT ACCEPT A RANGE – POSE FR2M2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2aM2.....installed the [MEASURE 2] that was installed through the Program?

\_\_\_ Response      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2cM2....installed the [MEASURE 2] that was installed through the Program *but at a later date*?

\_\_\_ Response      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2cM2 > 5, then ask:**

**[DO NOT ASK IF FR2cM2=98 OR 99]**



FR2ccM2. You indicated in your previous response that if the Multi-Unit Residential program had not been available there was an [FR2cM2] in 10 likelihood that you would have installed the same energy-efficient products *but at a later date*. Approximately how many months later would you have installed these products? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't know)
99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2ccM2 ANSWER IN MONTHS, READ:**

Would it have been within . . .

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3M2. If Efficiency Nova Scotia had not installed [MEASURE 2] for free, would you have paid the full cost of the [MEASURE 2]?

1. Yes
2. No
97. (Depends on the cost)
98. (Don't know)
99. (Refused)

**[ASK FR4 ONCE, NOT FOR EACH MEASURE VERIFIED IN V3-V4]**

FR4. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to install energy efficient measures through the Multi-Unit Residential program. Using a scale from 0 to 10 where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to implement the energy-efficient products you installed through the Program. DO NOT ACCEPT A RANGE

| Factor<br>(READ AND RANDOMIZE)                                                                        | Responses                                      |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------|
| a. The free installation of energy-efficient products offered by the program                          | ___ Response ___98 Don't Know ___99<br>Refused |
| b. Information received during an event held in the lobby area of your building                       | ___ Response ___98 Don't Know ___99<br>Refused |
| c. Information or advice provided by the program advisor during the evaluation or installation        | ___ Response ___98 Don't Know ___99<br>Refused |
| d. Previous experience with a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ___ Response ___98 Don't Know ___99<br>Refused |

### **SPILLOVER [SO series]**

SO1. Now I'd like you to think of the time since you participated in the Multi-Unit Residential Program. Have you implemented any additional energy-efficient measures or retired any old appliances on your own?

1. Yes
2. No [Go to D series]
98. (Don't know/Don't recall) [Go to D series]
99. (Refused) [Go to D series]

SO2. **IF SO1= YES, THEN ASK:** I just want to make sure I understand - **After** you participated in the Multi-Unit Residential Program, you installed additional energy-efficient measures or retired old appliances on your own. Is that correct?

1. Yes
2. No [Go to D series]
98. (Don't know) [Go to D series]
99. (Refused) [Go to D series]

Now, I will specifically talk about the additional actions you took on your own after participating in the Multi-Unit Residential Program.

SO3. [IF SO2 = 1 "YES"] Have you benefited from any other financing or rebate from any other *Efficiency Nova Scotia* program for these additional energy-efficient measures or appliance retirement, or do you plan to submit a funding request for these actions in the future?

1. Yes [Go to D series]
2. No
98. (Don't know [Go to D series])
99. (Refused) [Go to D series]

SO4. [IF SO3 = 2 'NO'] I would like to know what additional energy-efficient measures you have installed on your own or what appliances you have retired on your own after participating in the program.

Did you install additional... POSE THE FOLLOWING IN ORDER – DO NOT RANDOMIZE

SO4a. CFLs of any kind?

1. Yes
2. No
98. (Don't know)

SO4b. Faucet aerators?

1. Yes
2. No
98. (Don't know)

SO4c. Intelligent power bars with timers?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4d. Refrigerator Saver Thermometers?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4e. Low-flow showerheads?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4f. Other energy-efficient measures?

- 1. Yes
- 2. No
- 98. (Don't know)

Now, have you retired any old appliances since participating in the program? Have you....

SO4g. Retired a room air conditioner without getting a rebate?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4h. Retired a dehumidifier without getting a rebate?

- 1. Yes
- 2. No
- 98. (Don't know)

- SO5. [IF SO3 = 2 'NO'] How influential was your experience with the Multi-Unit Residential Program on your decision to implement these additional energy-efficient measures or retire these appliances on your own? Please, give your answer on a scale of 0 to 10, where 0 indicates that the Multi-Unit Residential Program “had no influence at all on your decision” and 10 indicates that the program was “extremely influential to your decision.” **[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

**DEMOGRAPHICS [D series]****[ASK ALL RESPONDENTS]**

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

- D2. How many bedrooms are in your house? [98=DK; Enter zero for a studio apartment with no bedrooms]
- D4. Do you pay the electric bills for your house?
- 1. Yes
  - 2. No
  - 98. (Don't Know)
  - 99. (Refused)
- D5. Is your house occupied year round, or is it a seasonal house?
- 1. Year round residence
  - 2. Seasonal / vacation home
  - 96. (Other, Specify \_\_\_\_\_)
  - 98. (Don't Know)
  - 99. (Refused)
- D6. Including yourself, how many people live in this residence on a full-time basis?
- Number of people: \_\_\_\_\_

**[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]**

D7. What is your age group? Are you..[READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation certificate)
2. (High school graduation certificate and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University certificate or diploma)
98. (Don't know)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
7. \$80,000 or more
98. (Don't know)
99. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

**[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK AND TERMINATE.]**

## APPENDIX VII - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Tenant name: \_\_\_\_\_

Building address: \_\_\_\_\_

Apartment number: \_\_\_\_\_

Telephone: \_\_\_\_\_

Type of dwelling:                      Single-unit: ☐                      Semi-attached: ☐                      Other: ☐

                                                 Duplex/Triplex: ☐                      Multi-unit: ☐

### 2 INFORMATION RELATIVE TO MEASURES

| CFLs (Twister)                                         |               |                |            |
|--------------------------------------------------------|---------------|----------------|------------|
|                                                        | Database Info |                | Validation |
| Date of installation:                                  | _____         | _____          | _____      |
| Number of 13-watt units installed:                     | _____         | _____          | _____      |
| Number of 23-watt units installed:                     | _____         | _____          | _____      |
| Type of lamp replaced ( <i>contact declaration</i> ):  | _____ Inc.    | _____ Halogens | _____ CFLs |
| Power of lamp replaced ( <i>contact declaration</i> ): | _____ W       | _____ W        | _____ W    |
| Number of units removed after installation:            | _____         |                |            |
| Explanation ( <i>contact declaration</i> ):            | _____         |                |            |
| Hours of use [hrs/day] ( <i>contact declaration</i> ): | _____         |                |            |

**Power Bars with Timers**

|                                             | Database Info | Validation |
|---------------------------------------------|---------------|------------|
| Date of installation:                       | _____         | _____      |
| Number of units installed:                  | _____         | _____      |
| With timer or automatic control?:           | _____         | _____      |
| If timer, is the timer in operation?:       | _____         | _____      |
| Number of units removed after installation: | _____         | _____      |
| Explanation ( <i>contact declaration</i> ): | _____         | _____      |
| Type of electronic devices plugged:         | _____         | _____      |

**Low-Flow Showerheads**

|                                             | Database Info | Validation |
|---------------------------------------------|---------------|------------|
| Date of installation:                       | _____         | _____      |
| Number of units installed:                  | _____         | _____      |
| Number of units removed after installation: | _____         | _____      |
| Explanation ( <i>contact declaration</i> ): | _____         | _____      |
| Source of energy for water heating:         | _____         | _____      |



## APPENDIX VIII - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Efficient Products – Multi-Unit Residential Renter program. For each participant, three levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did your household have any specific plans to install measure prior to talking with anyone about the program?                                                                                                                                                                                     | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to install the measure?                                                                                                                                                                                              | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have installed exactly the measure that you installed through the program? (Scale 0 to 10)                                                                                                                                                                       | FR2a = Answer x 10%                                                                                                                                                              |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                  | IF FR1 = 0% : FR2a / 2<br>IF FR1 = 100% : FR2a                                                                                                                                   |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c and d = Program factors                                                                                                                                                                                                                                                          | FR4_P = MAX(a; b; c; d)                                                                                                                                                          |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                  | (10 - FR4_P) x 10%                                                                                                                                                               |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient equipment <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                                           | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have installed these products?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>FR3.</b> If ENSC had not installed measure for free, would you have paid the full cost of the measure?                                                                                                                                                                                                                                          | IF 1. Yes: FR3 = 100%<br>IF 2 OR 9 : FR3 = 0%                                                                                                                                    |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                  | IF FR3 = 0% : FR2cc / 2<br>IF FR3 = 100% : FR2cc                                                                                                                                 |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                        | MEAN VALUE OF:<br>(PA1 ; PA2 ; PA3)                                                                                                                                              |

Subsequently, the final free-ridership level calculated for each participant was submitted to an inconsistency test. The inconsistency test consisted in verifying if  $(FR2a - FR4) \geq 30\%$ . In that case, the participant's answers to FR2a and FR4 represented an inconsistency and the smallest value between PA1 and PA2 was used in the final free-ridership calculation. Otherwise, PA1 and PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.



# **EFFICIENT PRODUCTS – DIRECT INSTALL PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Efficient Products-Direct Install (EP-DI) program. The 2011 evaluation was based on in-depth interviews with the Program Manager and one delivery agent, on 15 on-site visits as well as on a telephone survey of 70 program participants.

## **PROGRAM OVERVIEW**

The EP-DI program provides businesses and multi-unit residential buildings with free installation of energy-efficient products. Therefore, it overcomes knowledge, financial and time-related barriers that might prevent businesses from installing energy-efficient products. When the program was first launched in 2008, it was offered to small businesses only and promoted free installs of compact fluorescent lamps (CFLs) and light-emitting diode (LED) exit lights. In 2010, as the target market was getting saturated, the program added specialty CFLs to the list of products. In 2011, market saturation of CFLs led to an extended product offering to continue to meet energy-saving targets.

In 2011, the program promoted free installation of the following products:

- > 13 watt CFLs;
- > 23 watt CFLs;
- > LED exit lamps;
- > Chandeliers;
- > Dimmable CFLs;
- > Power bars with integrated timer;
- > Hot water tank wraps;
- > Commercial programmable thermostats;
- > Multi-unit residential building programmable thermostats; and
- > Occupancy sensors for lighting control.

Initially designed for small businesses, the program was, in 2011, extended to the larger business and institutional markets.

Additionally, at the end of November 2011 through December 2011, the EP-DI program included a pilot for LED parabolic aluminized reflector (PAR) lamps, identified as the Retail LED Direct Install pilot project. Products eligible for this pilot program were 14 W and 17 W LED PAR lamps.

The Efficient Products-Direct Install program aimed at achieving net electricity savings of 18.59 GWh and demand savings of 1.87 MW in 2011.



## **KEY FINDINGS**

The 2011 evaluation of the EP-DI program demonstrated that the program is well designed for the market it targets and has evolved a great deal since its beginning in 2008. The EP-DI program totalled 4,595 projects for the year 2011. Additionally, 254 projects were conducted under the Retail LED Direct Install pilot project. In terms of net energy savings, the program generated 25.792 GWh, which represents a slight increase in comparison to 2010 net savings (25.23 GWh).

### **Awareness**

The main source of awareness of the EP-DI program comes from the actions of program staff or representatives in general. More specifically, most participants learned about the program during an in-person visit or a telephone call from a program representative. Very few participants identified learning about the program through marketing material. These results highlight the use of the delivery agent's call centre and one-on-one encounters as important marketing tools to contact eligible businesses and promote the program. It also demonstrates that the use of promotional material was not intended as the main marketing strategy for this program.

Very little promotional material was fashioned, however, and program partners were invited to collaborate for its design and development. In spite of their involvement, program partners still expressed concerns about the capacity of such material to effectively promote the program. Furthermore, when asked about suggestions to improve the program, participants did suggest better marketing and advertising.

### **Satisfaction**

Nonetheless, satisfaction towards the program is very high among participants. Indeed, most participants expressed their satisfaction with the overall program and its various aspects. This result is continuous throughout the years as participants from past evaluations have also provided very high levels of satisfaction with the program. Participants who had CFLs, hot water tank wraps and thermostats installed through the program were also asked to rate their satisfaction with the products themselves. Most respondents answered being very satisfied in this regard. As a matter of fact, a vast majority of participants indicated that they were likely to purchase energy-efficient products in the future when installing or replacing actual energy-using products.

However, certain participants did have to remove some of the CFLs that had been installed through the program and had them replaced. Participants indicated that the lamp had burned out, broken, did not work with a dimmer switch or did not burn brightly enough.

Moreover, compared to 2010, a larger proportion of participants faced barriers and challenges in installing products. Participants mentioned that products provided by the program did not always fit in

the current equipment. The issue of bulbs suitable for dimmer switches and cold temperatures (e.g. walk-in freezer) was also raised. Finally, a lack of instructions for setting up the power bar with integrated timer and a lack of information about the program were also brought up as difficulties. In that line of thought, when asked to share their ideas on how to improve the program, participants suggested having more products and options as well as more information in general. It is to be noted that the addition of dimmable CFLs to the product list later in 2011 addresses some of the issues identified during the 2011 evaluation.

## Program Energy Savings

To calculate the net savings of the EP-DI program in 2011, Econoler reviewed the gross savings estimated by ENSC using a review of unitary savings results from the on-site visits and included interactive effects for lighting products and hot water tank wraps. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey. Through this approach, a free-ridership level of 15.4 percent was captured and a spillover level of 9.5 percent was identified, resulting in a net-to-gross ratio (NTGR) of 0.94 for all products installed under the EP-DI program. It is to be noted that a NTGR ratio of 1 was used for products installed under the Retail LED Direct Install pilot project.

**Table 1: Distortion Effects and Net-to-Gross Ratio for EP-DI Program**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 15.4%       |
| Spillover Level      | 9.5%        |
| Net-to-Gross Ratio   | 0.94        |

The evaluation revealed that the net savings at the generator for the EP-DI program combined with the savings for the Retail LED Direct Install pilot project amounted to 25.792 GWh for energy savings and 2.593 MW for demand savings in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR         | Net Savings       |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|--------------|-------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |              |                   |
| Tracked Savings from ENSC | 35.678 GWh            | 35.678 GWh              | 35.678 GWh                                       | 0.83         | 29.435 GWh        |
| <b>Evaluation Results</b> | <b>29.995 GWh</b>     | <b>29.995 GWh</b>       | <b>27.161 GWh</b>                                | <b>0.95*</b> | <b>25.792 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |              |                   |
| Tracked Savings from ENSC | 3.589 MW              | 3.589 MW                | 3.589 MW                                         | 0.83         | 2.961 MW          |
| <b>Evaluation Results</b> | <b>3.017 MW</b>       | <b>3.017 MW</b>         | <b>2.731 MW</b>                                  | <b>0.95*</b> | <b>2.593 MW</b>   |

\* NTGR of 0.94 for EPDI program and NTGR of 1 for Retail LED Direct Install pilot project. The combined NTGR value for all savings is 0.95.

These net evaluated savings fell short of those tracked by ENSC. The adjustments applied to unitary savings values, as well as the consideration of the interactive effects factors explain this difference. Even though the program evaluation NTGRs were revised upward to 0.94 for EP-DI products and to 1 for the Retail LED Direct Install pilot project, compared to 0.81 and 0.9 respectively for tracked savings, the additional savings were not enough to compensate for the impact of the necessary adjustments mentioned.

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the program:

- EP-DI-R1. Improve the tracking sheet to allow for a better validation of savings:** Several fields in the tracking sheet are not required for program administration. Those fields are present even though they are not filled and should be removed for clarity purposes. Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. The analysis of the 2011 tracking sheet revealed that the rate code values for the facility where the products were installed were missing or not available for 20 percent of the records. Finally, usage group labelling could be improved

to limit the usage of “Other” to identify the facility type. Knowing the type of facility where the measure is implemented is useful for evaluation purposes.

- EP-DI-R2. Include more material to the marketing strategies:** The 2011 evaluation results highlight the main use of the delivery agent’s call centre and one-on-one encounters as marketing tools to contact eligible businesses and promote the EP-DI program. Indeed, most participants have learned about the program from the actions of program staff or representatives. Very few participants have learned about the program through marketing material. However, both program partners and participants have shared their desire to improve program marketing and advertising. The present recommendation points out the necessity to explore other marketing strategies that include marketing material addressing both partner and participant requests for better, more effective marketing as well as for further information on the program in general.
- EP-DI-R3. Require additional information during survey campaigns with commercial and industrial (C&I) customers as well as from participants and increase the number of on-site visits to better calculate savings:** Additional information would be necessary on some measures in order to estimate savings that are closer to reality. For hot water tank wrap installations, the volume of the tank insulated should be collected. For occupancy sensors, information on the total wattage of lamps controlled by occupancy sensors and the hours of operation should be collected. In order to be able to use the savings calculation approach presented by the Ontario Power Authority for commercial thermostats, additional information should be collected on the rooms where programmable thermostats are installed and on the settings of such thermostats. For dishwasher spray valves, information on the time of use should be collected. For all participants who had lighting products, occupancy sensors or hot water tank wraps installed, information on the heating source and the use of air conditioning should be collected to better estimate the interactive effects factors. This information should also be collected during C&I survey campaigns. The number of on-site visits conducted for the evaluation should be increased for categories with a large number of projects like the CFL category. This would allow for the collection of reliable information for these categories and the establishment of adjustment values that could be used to correct savings.

## **1 PROGRAM DESCRIPTION**

### **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The 2011 Efficient Products-Direct Install (EP-DI) program, also known as “Part of the Solution” in the program literature, provides businesses and multi-unit residential buildings with free installation of energy-efficient products. The EP-DI program started in 2008 by offering free installs of regular compact fluorescent lamps (CFLs) and light-emitting diode (LED) exit signs to small businesses. In 2010, as the target market was getting saturated, the program started to offer, as a supplement, limited quantities of specialty CFLs to eligible businesses. In 2011, increased market saturation of CFLs led to an extended product offering to continue to meet energy savings targets.

To develop the 2011 product offering, Efficiency Nova Scotia Corporation (ENSC) used results of a survey conducted in 2010 with past program participants. These results suggested that 40 percent of all businesses were heated electrically and a significant percentage of those were interested in having programmable thermostats installed. Moreover, one in five past participants was interested in replacing dimmable lamps.

The eligible products in 2011 are the following:

- 1 13 Watt CFLs;
- 2 23 Watt CFLs;
- 3 LED exit lamps;
- 4 Chandeliers;
- 5 Dimmable CFLs;
- 6 Power bars with integrated timer;
- 7 Hot water tank wraps;
- 8 Commercial programmable thermostats;
- 9 Multi-unit residential building programmable thermostats; and
- 10 Occupancy sensors for lighting control.

The program delivery agent (DA) is Summerhill Group. The DA is partnering with a sub-contractor, Clean Nova Scotia (CNS), which is responsible for training representatives who promote the program as well as installers who install the different products. The DA also subcontracts electricians to install programmable thermostats and occupancy sensors. The EP-DI makes use of the delivery agent’s call centre as well as local business associations, such as local chambers of commerce and business improvement areas, to help promote the program to small businesses.

Although the program was initially designed for small businesses, in 2011 it was extended to all businesses and ENSC started actively pursuing larger businesses and institutions that did not previously meet the program criteria. Past participants were also contacted in 2011 to offer them the new products

not previously available. In 2011, the program started in March and ran until the end of the year.

From the end of November 2011 through December 2011, the EP-DI program included a pilot for LED parabolic aluminized reflector (PAR) lamps, identified as the Retail LED Direct Install pilot project. These products are installed free of charge in small retail businesses in replacement for halogen PAR lamps, in a similar fashion as with the other products covered by the EP-DI program. However, the DA for the Retail LED Direct Install pilot project is Nedco, who is also in charge of marketing activities for this pilot project.

The products eligible for the Retail LED Direct Install pilot project are 14 W and 17 W LED PAR lamps.

### **Program Objectives**

The goals of the EP-DI program are to:

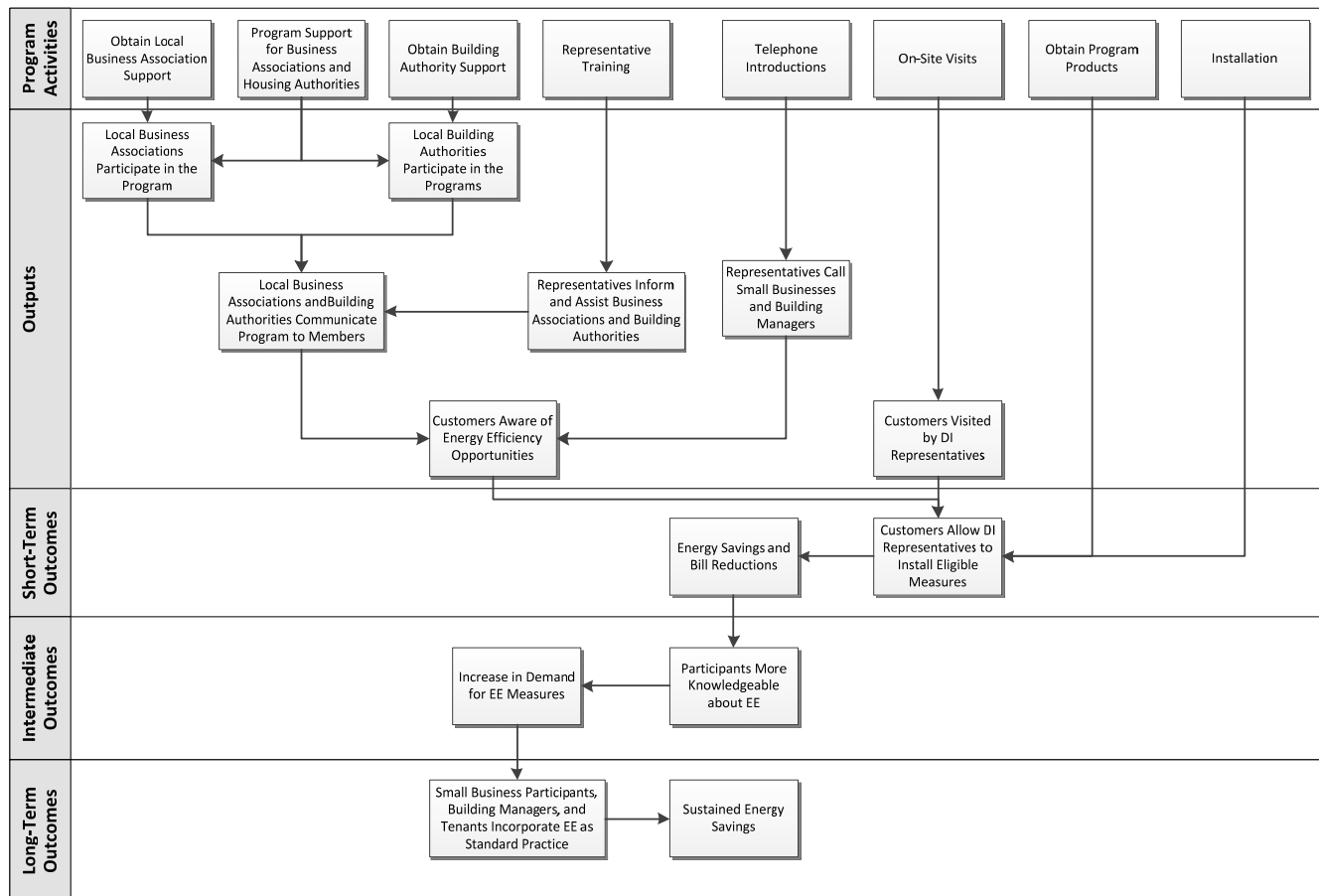
- > help clients overcome knowledge, financial and time-related barriers that prevent them from proceeding with the energy-efficient upgrades;
- > explain the environmental and financial benefits of taking part in the program;
- > make business owners aware of the energy and cost savings they gain from participating in the program and to encourage them to consider energy-efficient options when making decisions to purchase other energy-using equipment; and
- > eventually transform the market by raising the efficiency of standard practices.

Through these goals, the program aimed at achieving net electricity savings of 18.59 GWh and demand savings of 1.87 MW in 2011. These targets exclude savings for the Retail LED Direct Install pilot project. The EP-DI program generated net electricity savings of 25.23 GWh in 2010 and 39.52 GWh for 2008 and 2009 combined.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Efficient Products – Direct Install Program Logic Model**

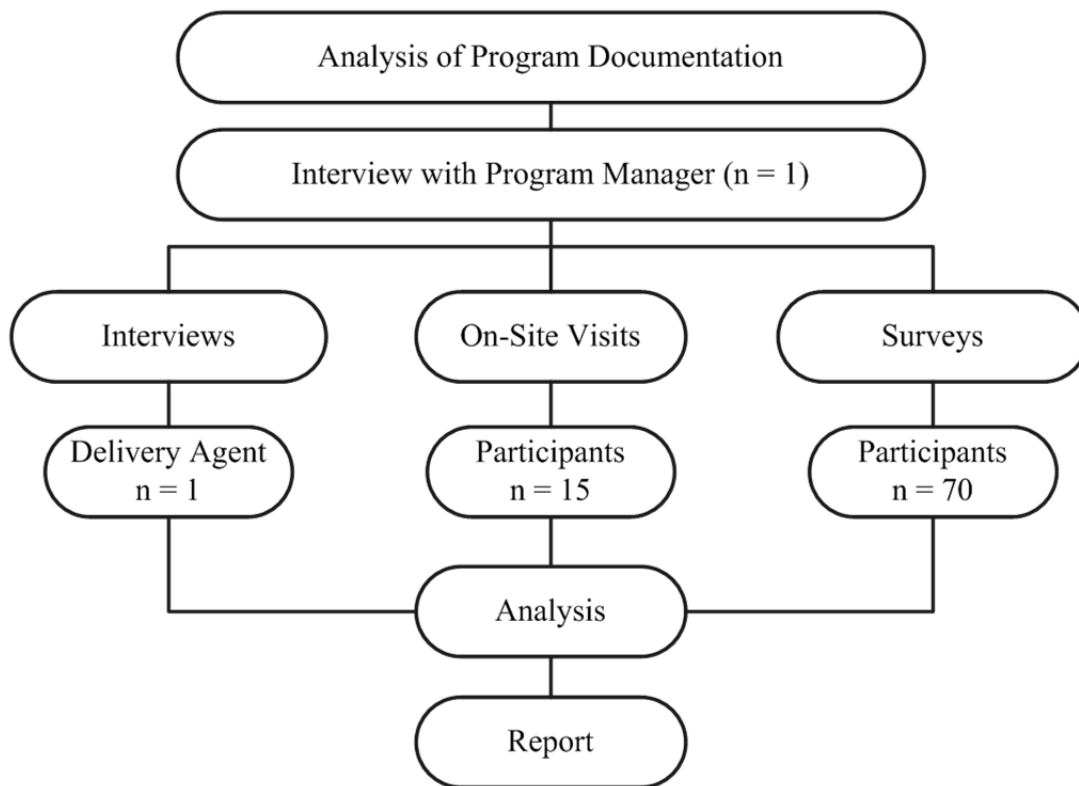


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of interview guides and the survey questionnaire are included in Appendices III, IV and V.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the EP-DI program was the analysis of the program documentation. At that stage, all available program information was reviewed.



The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interview for the process evaluation was finalized.

### **2.2.3 In-Depth Interview with Delivery Agent**

In September, one in-depth interview was conducted with the program DA. This interview was intended, among other things, to understand the DA's involvement in the program, their participation process in the program and their perception and satisfaction with the program.

### **2.2.4 On-Site Visits**

In November, 15 on-site visits were conducted at organizations where EP-DI products had been installed. They were conducted by Econoler's subcontractor, Equilibrium Engineering. Twelve of the site visits were conducted after the installation was completed by the delivery agent. They were used to validate the installation of products in accordance with the data found in the tracking sheet, including the amount of equipment installed, the type of technology and hours of operation. The hours of operation, pre- and post-installation, as well as the type of existing equipment, pre-installation, were collected by interviewing the site contact.

Three site visits were conducted on which the Evaluator accompanied the DA during the installation of the products. Those visits allowed Econoler to evaluate the information collected by the DA during the visits as well as the equipment installation process. They also helped assess the information provided by the DA to the facility manager, such as technical information regarding the use of the products installed through the program. This approach aimed to ensure that program delivery goals would be met.

The methodology used for the on-site visits carried out under the EP-DI program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VI.

### **2.2.5 Participant Survey**

A telephone survey with a total of 70 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews took place in October and November and utilized computer-assisted telephone interviewing (CATI). The average length of the survey was 18 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > previous program participation;
- > how participants learned about the program;
- > spillover and free-ridership;
- > participant motivations and barriers;
- > satisfaction with the program;
- > future intentions; and
- > energy attitudes and behaviours.

The profile of the organizations interviewed through the survey is featured in Appendix II. The table below shows the population and sample size, as well as the associated sampling error at the 90 percent confidence level for the 2008, 2009, 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population         | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|--------------------|-----------------|-------------------------------------------|
| 2008 Participants | 934                | 70              | ±9.5%                                     |
| 2009 Participants | 2,213              | 70              | ±9.7%                                     |
| 2010 Participants | 5,447              | 77              | ±9.3%                                     |
| 2011 Participants | 4,595 <sup>1</sup> | 70              | ±9.7%                                     |

<sup>1</sup> The EP-DI program totalled 4,595 projects in 2011. At the time of conducting the survey, the program totalled 1,551 projects (records without phone number or contact name excluded).

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the EP-DI program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

This process evaluation was performed through interviews with the PM and with the DA, as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The EP-DI program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what is presented in the EP-DI manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | EP-DI Program Manual |
|--------------------------------------------------------------------------------------------------------------|----------------------|
| Document revisions                                                                                           | ✓                    |
| Program description (including nature or type of program)                                                    | ✓                    |
| Program justification                                                                                        | ✓                    |
| Program objectives                                                                                           | ✓                    |
| Incentives                                                                                                   | ✓                    |
| Eligibility criteria                                                                                         | ⊘                    |
| Program partners and their roles                                                                             | ⚠                    |
| Program barriers                                                                                             | ✓                    |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⊘                    |
| Details about the savings calculations and type of products                                                  | ✓                    |

| Program Manual Content                                                                                                                  | EP-DI Program Manual |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Budget per year                                                                                                                         | ✓                    |
| Cost-effectiveness test results                                                                                                         | ✓                    |
| Market study or technical study that supports program elements or assumptions                                                           | ⚠                    |
| Marketing plan                                                                                                                          | ⚠                    |
| Evaluation plan                                                                                                                         | ⊘                    |
| Program theory                                                                                                                          | ✓                    |
| Logic model                                                                                                                             | ✓                    |
| Program process flow chart                                                                                                              | ⊘                    |
| Partner or participant process flow chart                                                                                               | ✓                    |
| Program forms                                                                                                                           | ⊘                    |
|  Information included in the program manual            |                      |
|  Information partially included in the program manual |                      |
|  No information                                      |                      |

Econoler has analyzed the EP-DI program manual. It contains relevant information useful for both the PM and the Evaluator. Notably, the description of the marketing outreach activities could serve as an example for other programs that are not as detailed. Even though the marketing outreach section of the program manual does not specify indicators to measure the success of different efforts, these efforts are sufficiently described for further monitoring purposes.

However, the program manual is missing important information, thereby making the understanding of the program design and delivery difficult. The following are recommendations in order to supplement and improve the tool:

- > **Document the major characteristics of the program:** Specific explanations on the role of the DA and its sub-contractor as well as explanation on how the replaced products will be disposed of through the program should be explained in the program manual.
- > **Provide a “base case”:** The program manual does not provide a “base case” that details information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.

- > **Provide the parameters used to estimate the program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. The program manual content should be continually updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of ENSC’s EP-DI program tracking sheet. In general, the tracking sheet is useful to the PM and provides a way to continuously monitor program savings. All the fields necessary for program administration are present, although several of them were missing values and some fields had no values at all. Energy savings are listed for each product.

The tracking sheet features information in three separate sheets: one lists customer information and the other two list details (quantity and characteristics of old and new equipment) for products installed in commercial and institutional buildings, in common areas and in individual rental units of multi-unit residential buildings. Each project has a unique identification number which links the customer information to the details for the different products installed for that project.

All customer information necessary to conduct field activities (surveys and on-site visits) was present in the tracking sheet. However, the rate code field is not filled systematically, even though this information is useful for the evaluation and is required by the PM for program management activities. Moreover the facility type (“Usage Group” field) is labelled as “Other” for numerous entries.

As for the measure sheet, the information provided is sufficient to calculate the energy savings.

The number of products and the characteristics of the old equipment, such as the wattage and the hours of operation, are filled in by the DA based on the information provided by participants. From this information, energy savings are calculated by the PM for 13 W and 23 W CFLs installed by the participant using the equation below when the information is available.

$$\begin{aligned}
 & \text{Annual energy savings} \left[ \frac{kWh}{\text{year}} \right] \\
 & = \\
 & \frac{(\text{Baseline lamp wattage } [W] - \text{Replacement lamp wattage } [W]) \times \text{Hours of operation} \left[ \frac{h}{\text{year}} \right]}{1000 \left[ \frac{Wh}{kWh} \right]} \\
 & \times \text{Number of lamps installed}
 \end{aligned}$$

For other products or when the old equipment wattage or the hours of operation are not available, the PM used prescriptive values that were obtained from previous program evaluations, from an energy savings study conducted for ENSC by Navigant Consulting and from other energy savings studies.

The program tracking sheet was evaluated by the PM during the interview. The PM is satisfied with the tracking sheet and considers it easy to use.

In conclusion, the tracking sheet provides all necessary information. However, several improvements are recommended to make this tool a better asset for the PM and the Evaluator. The Evaluator recommends that ENSC:

- > **Remove unnecessary fields:** The PM indicated that several fields in the tracking sheet are not required for program administration. Those fields are present even though they are not filled and should be removed for clarity purposes.
- > **Ensure that all fields are filled in systematically:** Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet. The analysis of the 2011 tracking sheet revealed that the rate code values for the facility where the products were installed were missing or not available for 20 percent of the records.
- > **Improve the labelling of the usage group field:** The usage group field is labelled as “Other” for almost 22 percent of the records. The list of usage groups provided to the DA should be expanded to facilitate the identification of the usage group for each facility, thereby limiting the usage of “Other.”

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, the Evaluator concludes that the EP-DI program is an appropriate program for this market. Indeed, the program allows for access to the business market, which is characterized by a high percentage of small businesses that do not participate in energy efficiency programs for reasons such as product incompatibility, liability or quality concerns, a lack of interest in or knowledge of these programs or a lack of time.

In 2011, the EP-DI program has been upgraded in several regards. In particular, in order to ensure energy savings, EP-DI has expanded the target market to larger businesses and institutions that did not previously meet the eligibility criteria for the program. Furthermore, the products now include unlimited quantities of CFLs and programmable thermostats. Other products such as pipe insulation, water heater blankets, power bars with timers and occupancy sensors were also piloted in 2011.

Econoler has the following comments and recommendations on the design and delivery of the program:

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operations, which is usually easier to collect than it is during the evaluation stage as the latter can take place several months after the project is complete. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Standardize the program name across all channels:** Econoler understands that the program name should reflect its nature and that ENSC wants to make its mark in the market. Nevertheless, changing the commercial name of the program can only bring confusion in the market. Moreover, the commercial name of the program is “Part of the Solution” while the in-house monitoring name is “Efficient Products Direct Install.” The Evaluator’s recommendation is to limit changing names as much as possible and use the same name in all contexts.

### **3.5 ENSC WEBSITE**

Customers can consult the ENSC website to find relevant information regarding the EP-DI program, such as the list of proposed products. The website provides examples of six products covered by the program. The program manual includes, on page 34, 10 products. The Evaluator understands that the website only provides examples, but Econoler recommends listing all 10 products for the benefit of participants.



## 3.6 RELATIONSHIP WITH PARTNERS

The change of responsibilities from Nova Scotia Power (NSPI) to ENSC has caused some confusion in the market along with some delays and adjustments. The confusion comes mainly from other ENSC programs such as the Multi-Unit Residential pilot program and the SBES program, along with the fact that the new program name does not speak for itself. Moreover, mid-course modifications require major changes to the way the DA operates and there have been complaints from the sub-contractor related to resource constraints due to additional scope changes.

Satisfaction with the relationship between the sub-contractor and ENSC personnel is high, and no complaints from participants have been received. Although partner satisfaction with the overall program is very high, the program scope and boundaries need to be better defined at the outset to limit design changes. Moreover, even if the DA was involved in the development of promotional material, concerns were expressed about the ability of such material to effectively promote the program. Furthermore, surveyed participants mentioned the need for better program advertising.

## 3.7 PARTICIPANT PERSPECTIVES

### 3.7.1 Previous Program Participation

In 2011, a significant proportion of survey participants (40%, up 37 points from last year's findings) indicated that they participated in other NSPI or ENSC energy efficiency programs before participating in the EP-DI program.

Among respondents who participated in previous programs, the majority (70%) participated in a lighting program (without providing more detail as to the specific program).

**Table 5: Previous Program Participation**

| Previous Program Participation | 2008 | 2009 | 2010 | 2011 |
|--------------------------------|------|------|------|------|
| <i>Sample Size</i>             | 70   | 70   | 77   | 70   |
| Previous participation         | 7%   | 6%   | 3%   | 40%  |

### 3.7.2 Program Awareness

In 2011, the actions of program staff or representatives are the main source of awareness of the program. Indeed, just over six in 10 participants report first having learned about the EP-DI program from an ENSC staff person (64%). Six in 10 participants first learned about the program at an in-person visit from a program representative (60%), while four in 10 respondents received a phone call from a program representative (43%). Just over two in 10 learned about the program through word of mouth (23%), while fewer than two in 10 heard of the program from a previous program participant (16%). One in 10 learned about the program at an ENSC presentation (10%) or off the ENSC website (10%).

**Table 6: Program Awareness**

| <b>Program Awareness</b>                  | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011*</b> |
|-------------------------------------------|-------------|-------------|-------------|--------------|
| <i>Sample Size</i>                        | <i>70</i>   | <i>70</i>   | <i>77</i>   | <i>70</i>    |
| PA/ENSC staff person                      | 30%         | 11%         | 4%          | 64%          |
| In-person visit from program staff person | 14          | 34          | 8           | 60           |
| Phone call from program representative    | 23          | 25          | 27          | 43           |
| Business associate/friend/word of mouth   | 9           | 19          | 7           | 23           |
| Another/previous program participant      | 7           | --          | 18          | 16           |
| NSPI/ENSC presentation                    | --          | 3           | 5           | 10           |
| PA/ENSC website                           | 3           | <1          | --          | 10           |
| Program literature received in mail       | --          | --          | --          | 7            |
| Email                                     | 1           | <1          | 21          | --           |
| Program literature                        | 7           | --          | 4           | --           |
| Newspaper                                 | --          | 5           | 1           | --           |
| Chamber of commerce                       | 3           | <1          | --          | --           |
| Other                                     | 0           | <1          | 4           | 6            |
| Don't know                                | 3           | 2           | 1           | --           |
| *Multiple responses <sup>2</sup>          |             |             |             |              |

<sup>2</sup> In assessing the source of program awareness, participants had historically been allowed to indicate only one response, representing the source of first contact with the program. In 2011, the survey changed to allow multiple responses in order to appraise sources of contact that might have occurred simultaneously. This has resulted in significant differences from previous years in several sources of awareness.

### **3.7.3 Participation Motivations and Barriers**

To assess participation motivations, participants were asked why they had participated in the EP-DI program in 2011. As in the past, the majority of respondents continued to report reasons related to financial benefit, stating their motivation to save on energy costs (57% as a first motivation and 34% as a secondary motivation). Further motivations include a desire to help the environment (11%), although the proportion who indicated this response has decreased significantly from 2010.

Since saving on energy costs is the most important motivation for participating in the EP-DI program, program communications should continue to focus on energy bill savings.

**Table 7: Reasons for Participating**

| Most Important Motivation            | 2008                      |                                  | 2009                      |                                  | 2010                      |                                  | 2011                      |                                  |
|--------------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|
|                                      | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation |
| <i>Sample Size</i>                   | 70                        | 70                               | 70                        | 70                               | 77                        | 77                               | 70                        | 70                               |
| Save on energy costs/bills           | 71%                       | 16%                              | 65%                       | 20%                              | 79%                       | 10%                              | 57%                       | 34%                              |
| Program was free                     | --                        | 1                                | 6                         | 5                                | 4                         | 3                                | 11                        | 4                                |
| To conserve energy/power             | --                        | --                               | --                        | --                               | --                        | --                               | 7                         | --                               |
| Take advantage of incentive          | 15                        | 16                               | 13                        | 8                                | 5                         | 5                                | 6                         | 3                                |
| Help protect the environment         | 6                         | 29                               | 3                         | 18                               | 8                         | 25                               | 4                         | 11                               |
| Reduce carbon footprint              | --                        | 4                                | 2                         | 3                                | --                        | 11                               | 1                         | 6                                |
| Energy efficiency                    | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 9                                |
| Reduce maintenance costs             | 3                         | 10                               | --                        | <1                               | --                        | 13                               | --                        | 1                                |
| Improve existing lighting conditions | 3                         | 9                                | --                        | 5                                | --                        | 4                                | --                        | 1                                |
| Past program participation           | --                        | 1                                | --                        | --                               | --                        | --                               | --                        | --                               |
| Part of a green initiative           | --                        | 1                                | --                        | --                               | --                        | --                               | --                        | --                               |
| Assistance with changing lighting    | --                        | 1                                | --                        | --                               | --                        | --                               | --                        | --                               |
| Offer at our facilities              | --                        | 1                                | --                        | --                               | --                        | --                               | --                        | --                               |
| Did not require much work            | 1                         | --                               | --                        | --                               | --                        | --                               | --                        | --                               |
| Other                                | --                        | --                               | 5                         | 7                                | 1                         |                                  | 13                        | 6                                |
| Refused                              | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 3                                |
| Don't know                           | 1                         | 10                               | 5                         | 33                               | 3                         | 29                               | --                        | 21                               |

Compared to 2010, a significantly higher percentage of respondents reported having faced a challenge or barrier in installing the energy-efficient products provided through the program (27%, up 20 points from last year). More than one-half of those who did face a challenge or barrier ( $n = 19$ ) reported that the energy-efficient equipment brought by the program representative did not work or could not be installed (58%). More precisely, some respondents mentioned that products provided by the program such as CFLs, chandeliers, programmable thermostats and occupancy sensors did not always fit with their installation or in their existing equipment. Mentions were given for CFLs that did not fit inside safety protective bulbs or special fixtures, programmable thermostats that did not meet the required power capacity and light switches that were positioned in a way such that occupancy sensors could not be used. The issue of bulbs suitable for dimmer switches and cold temperatures (e.g. walk-in freezers) was also raised by a few participants. For instance, it was mentioned that the dimmable bulbs provided by the program were not suitable in places such as dining rooms where lower wattage dimmable bulbs are used. Respondents therefore suggested increasing the diversity of the products offered through the program. Finally, one respondent mentioned a lack of instructions for setting up the power bar with integrated timer and a lack of information about the program as a barrier to participation.

**Table 8: Barriers Faced During Program Participation**

| Barriers Faced     | 2008 | 2009 | 2010 | 2011 |
|--------------------|------|------|------|------|
| <i>Sample Size</i> | 70   | 70   | 77   | 70   |
| No                 | 86%  | 75%  | 92%  | 71%  |
| Yes                | 11   | 20   | 7    | 27   |
| Don't know         | 3    | 5    | 1    | 1    |

### 3.7.4 Energy Attitudes

The results of the survey indicate that participants have a very positive attitude towards energy efficiency. Nearly all respondents reported that reducing energy usage (96%) and managing energy costs (99%) are important to their businesses. Figures are consistent with those reported in previous years.

**Table 9: Importance of Energy**

| Importance of Energy*                                                                               | 2008     |     | 2009     |     | 2010     |     | 2011     |     |
|-----------------------------------------------------------------------------------------------------|----------|-----|----------|-----|----------|-----|----------|-----|
|                                                                                                     | <i>n</i> | %   | <i>n</i> | %   | <i>n</i> | %   | <i>n</i> | %   |
| Importance of reducing energy usage                                                                 | 70       | 99% | 69       | 91% | 76       | 96% | 70       | 96% |
| Importance of managing energy costs                                                                 | 69       | 97% | 70       | 92% | 74       | 95% | 70       | 99% |
| *Those giving a rating of 5 or 4 on a scale where 5= "Very satisfied" and 1= "Not at all satisfied" |          |     |          |     |          |     |          |     |
| **Don't-knows removed from calculations                                                             |          |     |          |     |          |     |          |     |

### 3.7.5 Prior Purchases

Organizations were asked about purchase behaviours for energy-efficient products before participation in the program. Among organizations that were outfitted with CFLs, two-thirds reported having already purchased CFLs prior to participating in the EP-DI program, which is consistent with previous findings (66%). Overall, one-third (34%) of organizations that participated in the program had previously purchased the specific energy-efficient equipment they received through the program. This significant decrease compared with previous findings is explained by the addition of new products in the program offering, which is no longer limited to CFLs and LED exit signs.

It should be noted that while two-thirds of organizations had already purchased CFLs prior to their participation in the program, they still had sockets containing low-efficiency light bulbs. Therefore, the program (which only provided CFLs for the replacement of low-efficiency light bulbs) has increased the number of CFLs installed in organizations that had already purchased CFLs before program participation.

**Table 10: Prior Purchases of Efficient Lighting Products**

| Previously Purchased Products | 2008 | 2009 | 2010 | 2011    |      |            |             |
|-------------------------------|------|------|------|---------|------|------------|-------------|
|                               |      |      |      | Overall | CFLs | Tank Wraps | Thermostats |
| <i>Sample Size</i>            | 70   | 70   | 77   | 70      | 32   | 50         | 8 (#)       |
| Yes                           | 70%  | 65%  | 69%  | 34%     | 66%  | 2%         | 2           |

### 3.7.6 Program Influence

Organizations were asked to rate the importance of program elements that might have influenced their decision to participate in the program and have energy-efficient products directly installed. The free products were considered extremely important (mean from 8.6 to 9.2 out of 10), followed by the free installation service, which was also deemed very important (mean from 8.2 to 9.6 out of 10). For the respondents who installed hot water tank wraps as part of the program, the free installation service was the most important influencing factor in their decision to install such products. The information received during the initial contact with the program representative was also considered important to respondents (mean from 7.0 to 8.1 out of 10).

**Table 11: Importance of Program in Influencing Decision to Install Energy-Efficient Products**

| Importance of Program in Influencing Decision to Install Energy-Efficient Products | CFLs | Tank Wraps | Thermostats |
|------------------------------------------------------------------------------------|------|------------|-------------|
| <i>Sample Size</i>                                                                 | 32   | 50         | 8           |
| Mean (0=Not at all important, 10=Extremely important)                              |      |            |             |
| Free products                                                                      | 8.6  | 9.2        | 9.1         |
| Free installation service                                                          | 8.2  | 9.6        | 8.5         |
| Information received during initial contact with the program representative        | 7.3  | 8.1        | 7.0         |

### 3.7.7 Future Energy Efficiency Actions

The vast majority of respondents continued to report that they were likely to purchase energy-efficient products when installing or replacing energy-using products in the future, as a combined nine in 10 indicated a high likelihood of purchasing such products (76% rating 5, 16% rating 4 out of 5).

**Table 12: Future Energy Efficiency Purchases**

| Likelihood of Making Energy-Efficient Purchases in the Future | Sample Size | Rating: 5= "very likely" and 1 = "not at all likely" |    |    |    |    |         |
|---------------------------------------------------------------|-------------|------------------------------------------------------|----|----|----|----|---------|
|                                                               |             | 5                                                    | 4  | 3  | 2  | 1  | Refused |
| 2008                                                          | 67          | 78%                                                  | 13 | 7  | 1  | 0  | --      |
| 2009                                                          | 68          | 81%                                                  | 19 | -- | -- | -- | --      |
| 2010                                                          | 76          | 80%                                                  | 15 | 3  | 1  | 1  | --      |
| 2011                                                          | 70          | 76%                                                  | 16 | 7  | -- | -- | 1       |

### 3.7.8 Satisfaction with the Program

As in the past, respondents were asked to rate their satisfaction with the EP-DI program overall and with various aspects of the program. Again this year, there is a high level of overall satisfaction with the program. Nine in 10 participants (91%) offered a satisfaction rating of 5 or 4 when assessing the program overall, which is consistent with findings from previous years. In addition, the majority of participants are satisfied with the installers or contractors doing installation work (97%), the completion of the project on schedule (96%), the installation process (94%), the audit technician or contractor (92%), their interaction and communication with contractors (91%), the scheduling and timing of the installation (91%), their initial contact (91%) as well as the on-site lighting audit (85%).

**Table 13: Satisfaction with EP-DI Program**

| Satisfaction with Program*                                                                          | 2008     |      | 2009     |     | 2010     |     | 2011     |     |
|-----------------------------------------------------------------------------------------------------|----------|------|----------|-----|----------|-----|----------|-----|
|                                                                                                     | <i>n</i> | %    | <i>n</i> | %   | <i>n</i> | %   | <i>n</i> | %   |
| Program overall                                                                                     | 66       | 98%  | 68       | 95% | 68       | 97% | 69       | 91% |
| Installers or contractors doing the installation work                                               | 61       | 99%  | 65       | 96% | 61       | 95% | 68       | 97% |
| Completion of project on schedule                                                                   | 63       | 94%  | 64       | 97% | 65       | 94% | 69       | 96% |
| Installation process                                                                                | 61       | 100% | 66       | 92% | 67       | 97% | 68       | 94% |
| Audit technician or contractor                                                                      | -        | -    | -        | -   | -        | -   | 61       | 92% |
| Interaction and communication with contractors                                                      | 62       | 96%  | 68       | 95% | 65       | 95% | 69       | 91% |
| Scheduling and timing of installation                                                               | 64       | 92%  | 67       | 89% | 66       | 91% | 68       | 91% |
| Initial contact                                                                                     | 62       | 92%  | 64       | 94% | 65       | 91% | 70       | 91% |
| On-site lighting audit                                                                              | 34       | 91%  | 51       | 89% | 57       | 96% | 53       | 85% |
| *Those giving a rating of 5 or 4 on a scale where 5= "Very satisfied" and 1= "Not at all satisfied" |          |      |          |     |          |     |          |     |
| **Don't-knows removed from calculations                                                             |          |      |          |     |          |     |          |     |

When asked specifically about their satisfaction with products installed through the program, the majority of those respondents who had installed CFLs (78%), hot water tank wraps (90%) and programmable thermostats (all surveyed participants) were satisfied in this regard.

**Table 14: Satisfaction with Installed Products**

| Satisfaction with Products Installed Through Program | CFLs | Hot Water Tank Wraps | Thermo-stats (#) |
|------------------------------------------------------|------|----------------------|------------------|
| <i>Sample Size</i>                                   | 32   | 50                   | 8                |
| Very satisfied                                       | 47%  | 66%                  | 7                |
| Satisfied                                            | 31%  | 24%                  | 1                |
| Neither satisfied nor dissatisfied                   | 9%   | 6%                   | --               |
| Dissatisfied                                         | --   | 2%                   | --               |
| Very dissatisfied                                    | 9%   | --                   | --               |
| Don't know                                           | 3%   | 2%                   | --               |



### 3.7.9 CFLs Removed

Among those who had CFLs installed as part of the EP-DI program, 38 percent of respondents (up 29 points) had all or some of their CFLs removed. Those participants (n = 12) indicated that the lamp had burned out, broken, did not work with a dimmer switch or did not burn brightly enough. After removal, six participants indicated having discarded the CFLs, while three put them away in storage and one participant installed them at another location. It should be noted that information about the removal of CFLs among surveyed participants was not used in the impact calculation (see Section 4.2.13 for additional details).

**Table 15: Removal of CFLs and LEDs**

| <b>Products Removed</b>            | <b>2008</b> |             | <b>2009</b> |             | <b>2010</b> |             | <b>2011</b>     |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| <i>Sample Size</i>                 | 70          |             | 70          |             | 77          |             | 32 <sup>3</sup> |
| Did not remove any lighting        | 93%         |             | 88%         |             | 86%         |             | 63%             |
| Removed only CFLs                  | 1           |             | 12          |             | 9%          |             | 38%             |
| Removed only LED exit lights       | 3           |             | --          |             | --          |             | --              |
| Removed some CFLs and some LEDs    | 1           |             | <1          |             | --          |             | --              |
| Don't know                         | 1           |             | --          |             | 5           |             | --              |
| <b>Reasons for Removing Lights</b> | <b>2008</b> |             | <b>2009</b> |             | <b>2010</b> |             | <b>2011</b>     |
|                                    | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b>     |
| <i>Sample Size</i>                 | 3           | 2           | 8           | 1           | 7           | 0           | 12              |
| Burned out                         | --          | --          | 5           | --          | 3           | --          | 7               |
| Broke                              | --          | --          | --          | --          | 1           | --          | 2               |
| Doesn't work with dimmer switch    | --          | --          | --          | --          | --          | --          | 2               |
| Bulb not bright enough             | --          | --          | 1           | --          | --          | --          | 1               |
| Heard negative things about CFLs   | --          | --          | --          | --          | 1           | --          | --              |
| Retrofit lighting to T8s           | 1           | --          | --          | --          | --          | --          | --              |
| To save energy                     | 1           | 1           | --          | --          | --          | --          | --              |
| Doesn't fit properly               | --          | --          | 2           | --          | --          | --          | --              |
| Don't know                         | 1           | 1           | --          | 1           | 2           | --          | --              |
| <b>Disposal of Removed Lights</b>  | <b>2008</b> |             | <b>2009</b> |             | <b>2010</b> |             | <b>2011</b>     |
|                                    | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b> | <b>LEDs</b> | <b>CFLs</b>     |
| <i>Sample Size</i>                 | 3           | 2           | 8           | 1           | 7           | 0           | 12              |
| Threw away                         | --          | --          | 1           | --          | 4           | --          | 6               |
| Put in storage                     | 2           | 1           | 6           | --          | 2           | --          | 3               |
| Don't know                         | 1           | 1           | --          | 1           | 1           | --          | 2               |
| Installed at another location      | --          | --          | --          | --          | --          | --          | 1               |
| Gave away                          | --          | --          | 1           | --          | --          | --          | --              |

<sup>3</sup> The maximal margin of error associated with this sample size is  $\pm 14.6\%$  at the 90% confidence level.

### 3.7.10 Participant Recommendations for Improvements

One-half of respondents did not offer any suggestions for improving the program (51%). One in 10 mentioned more products and options (11%), better marketing and awareness (10%), or more information in general (9%). Other mentions included hiring knowledgeable and competent staff (6%), installing better products (6%) and offering the program to homeowners (4%).

**Table 16: Recommendations for Improvements**

| <b>Participant Suggestions</b>     | <b>2011</b> |
|------------------------------------|-------------|
| <i>Sample Size</i>                 | <i>70</i>   |
| Offer more products/options        | 11%         |
| Better marketing/awareness         | 10          |
| Provide more information           | 9           |
| Hire knowledgeable/competent staff | 6           |
| Better products                    | 6           |
| Offer the program to homeowners    | 4           |
| Other                              | 7           |
| Don't know/no answer/refused       | 51          |

Six in 10 respondents believed that a diagram illustrating the steps of the program would have facilitated participation in the program (59%). This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 17: Provision of a Diagram Illustrating Steps of Program**

| <b>Diagram Illustrating Steps of Program Would have Facilitated Participation</b> | <b>2011</b> |
|-----------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                | <i>70</i>   |
| Significantly                                                                     | 33%         |
| Somewhat                                                                          | 26          |
| Slightly                                                                          | 14          |
| Not at all                                                                        | 26          |
| Don't know                                                                        | 1           |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > savings calculation methodology for each type of product;
- > hours of operation;
- > installation rate;
- > interactive effects;
- > free-ridership; and
- > internal spillover.

The impact evaluation was based on a review of the program tracking sheet, 15 on-site visits and 70 participant surveys.

The review of the program tracking sheet included an analysis of the assumptions used and the methodology to calculate savings for the different types of eligible products.

As recommended in the Savings Verification Study relative to the 2010 DSM programs, on-site visits were performed for each sub-category of measures, except when savings in a sub-category were deemed too low to require an on-site visit. On-site visits were used to verify the type of technology installed in the participants' facility as well as to collect information from the site contact regarding hours of operation. Information on the space heating source and heating, ventilation and air conditioning (HVAC) equipment was also obtained during on-site visits when required. Three on-site visits were conducted during product installation by the delivery agent. The visits were intended to collect information on old and existing products and ensure that all the required data had been collected during the installation.

The data collected during these two activities were used to establish installation rates, hours of operation and interactive effects affecting program demand and energy savings. All these activities were used to calculate a unitary savings value for each eligible product under the program.

The participant surveys provided information to calculate the net-to-gross ratio (NTGR) for this program, including free-ridership and internal spillover. The NTGR was used to calculate the program net savings.

### 4.1.1 On-Site Visit Sampling and Protocol

#### Sampling Methodology

The sampling was established from the participant list provided in the EP-DI database (Jobs List and Measures List sheets). The tracking sheet accounted for 4,595 unique projects for 10,349 entries in the measures sheets. A total of 3,174 measure entries represent installations conducted in individual rental units of multi-unit residential buildings while the remainder corresponds to installations conducted in commercial buildings or in common areas of multi-unit residential buildings.

In order to cover the main products installed and to consider projects in all ranges of savings, several operations were conducted on the database. Products installed were sorted by category to establish the number of products for each category as well as the total energy savings for those categories (see Table 18 below). This allowed the allocation of the number of site visits for each category of products. A threshold was established at one percent of total savings, under which no site visit was conducted for a given category. Percentages of total savings for categories above the threshold are underlined. At the time of sampling, occupancy sensor installations represented 0.7 percent of total savings, resulting in no on-site visit conducted for this category, even though year-end results indicated that 4.8 percent of savings had been achieved from these installations. Moreover, no on-site visit was conducted for the power bars with integrated timer and dishwasher spray valves categories as savings for each of these categories represented less than 1 percent of total savings.

**Table 18: Total Number of Projects and Total Gross Energy Savings for Each Category of Products Installed – From Tracking Sheet**

|                               | Category of Products Installed |                      |                |                   |                       |                          |                         |
|-------------------------------|--------------------------------|----------------------|----------------|-------------------|-----------------------|--------------------------|-------------------------|
|                               | CFLs                           | Hot Water Tank Wraps | LED Exit Signs | Occupancy Sensors | Power Bars with Timer | Programmable Thermostats | Dishwasher Spray Valves |
| Total Number of Installations | 182,166                        | 5,967                | 1,814          | 3,502             | 1,724                 | 7,784                    | 37                      |
| Total Savings (MWh)           | 17,189                         | 2,381                | 459            | 1,370             | 92                    | 7,545                    | 93                      |
| % of Total Savings            | <u>60.0%</u>                   | <u>8.3%</u>          | <u>1.6%</u>    | 4.8%              | 0.3%                  | <u>24.7%</u>             | 0.3%                    |

Furthermore, projects were sorted on the basis of energy savings using two strata. The first stratum included projects with energy savings up to 10,000 kWh while the second stratum included projects with savings above 10,000 kWh. The hot water tank wrap and LED exit sign categories had no project with savings above 10,000 kWh. Thus, for those two categories, sites were selected randomly. However, for the CFL and programmable thermostat categories, several projects had savings in both strata.

A list of preferable regions, close to major city centres, was established for site visit selection. The following areas were considered:

- > Halifax;
- > Dartmouth;
- > Sydney and North Sydney;
- > Coldbrook and Kentville; and
- > Pictou County.

For the three site visits conducted during product installation, the sites were selected based on the DA schedule. The exact information on the number or on the type of replacements to be made was not available before the visits. However, it was possible to acquire some basic information to select certain types of sites. Based on the information presented in Table 18, it was decided to conduct one site visit for each of the three categories featuring the most savings. Thus, visits were conducted for sites where the following products were to be installed:

- > CFLs;
- > commercial & multi-unit residential buildings programmable thermostats; and
- > hot water tank wraps.

### **On-Site Visit Protocols**

An on-site visit protocol listing the information to be collected for each site was developed for post-installation visits. For each site, and for lighting categories, the information on the type, wattage and number of products was collected for old products and new products installed for lighting categories. For other categories, the details on the number of products installed and their use was collected. In addition, the hours of operation were collected for each facility visited, based on the site contact declaration. Furthermore, information on facilities' heating and cooling equipment and usage was also collected for lighting products. A specific on-site visit protocol was developed for visits conducted during product installation. This protocol was used to collect information on the old and new lighting products installed and on tank wraps and thermostats installations.

The detailed on-site visit protocols are presented in Appendix VI.

## **4.2 GROSS SAVINGS**

The gross savings estimation was computed based on the information available in the program tracking sheet as well as on data collected during the on-site visits and the savings review.

The tracking sheet provided by the PM for 2011 contained a total of 10,346 installations, all of which were completed. In order to better assess savings, the PM separated measures implemented in

individual rental units of multi-unit residential buildings from all other measures, including measures implemented in common areas of multi-unit residential buildings. However, this separation was solely based on the rate code obtained for each facility. The Evaluator recommends that the location where the measure is implemented be collected by the DA for all buildings since savings can differ depending on whether measures are installed in common areas or in individual renter units.

For each eligible product, a unitary savings value is used based on previous program evaluations, on the Navigant study and on other energy savings studies. Products like CFLs can be installed in commercial and institutional buildings, in common areas of multi-unit residential buildings and in individual rental units of multi-unit residential buildings. Different unitary savings are used depending on where products are installed. Products installed in common areas of multi-unit residential buildings are considered to have a similar usage as products installed in non-residential buildings. Thus, they are included in the non-residential category. However, different unitary savings values are used for products installed in individual rental units since the usage of products installed in these facilities is significantly different from the usage of products installed in non-residential facilities.

For the 2011 evaluation, savings were estimated based on unitary savings values for all products. The unitary savings review for each product is presented below.

Moreover, for 13 W and 23W CFL products, savings are estimated based on the hours of operation declared by participants and on the displaced wattage, when this information was available.

#### **4.2.1 13 W CFLs**

When savings are not calculated based on the hours of operation provided by the site contact, ENSC uses a unitary savings value of 127 kWh per 13 W CFL installed in a non-residential building and 41 kWh per 13 W CFL installed in a residential building. These two values were revised for the 2011 evaluation.

##### 13 W CFLs Installed in Non-Residential Buildings

The unitary savings value used by ENSC for 13 W CFLs installed in non-residential buildings was obtained from the 2010 evaluation report. However, this report does not provide any detail on how the value was obtained.

Econoler revised this savings value using an approach similar to the one presented in the Ontario Power Authority (OPA) Prescriptive Measures and Assumptions report<sup>4</sup> for this product. The revision was conducted using the information available in the tracking sheet received for 2011.

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<sup>4</sup> Ontario Power Authority (OPA), "2011 Prescriptive Measures and Assumptions,"  
<http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists>.

### Displaced Wattage

The displaced wattage value was established based on the wattage value available in the tracking sheet for the old equipment. This value was filled for 93 percent of 13 W CFL installations. An average of 61.4 W was obtained for old incandescent bulbs by calculating the weighted average of the wattage value and the number of products installed, for all the projects where this value was available in the tracking sheet. Based on the average old wattage value, the displaced wattage value was calculated using the equation below:

$$\text{Displaced Wattage} = 61.4 \text{ W} - 13.0 \text{ W} = 48.4 \text{ W}$$

### Hours of Operation

In 2011, Econoler established a daily average of 8.53 hours of operation for 13 W CFLs. This value is based on the number of products installed and on the weighted average of hours declared by site contacts during lamp installations by the DA.

### Unitary Savings Calculation

The equation below presents the unitary savings calculation.

$$\text{Annual Unitary Savings} = \frac{48.4 \text{ W} \times 8.53 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 150.7 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value used for 13 W CFLs to 150.7 kWh per year.

### 13 W CFLs Installed in Residential Buildings

ENSC uses the same unitary savings value of 41 kWh for all CFLs installed under its residential programs. This assumption comes from an analysis conducted for the 2009 evaluation of the Low Income program. It presented several studies indicating that 13 W CFLs show annual savings ranging from 29.6 kWh to 44.3 kWh and recommended continuing to use the 41 kWh savings assumption. This past evaluation considered that 13 W CFLs usually replace 60 W incandescent bulbs; as a result, the time of operation used to calculate the 41 kWh saving should be equal to 2.4 h/day. This, in turn, corresponds to the daily usage of interior fixtures estimated from the telephone survey conducted in 2010 under the Retail Markdown Program (RMP).

### Displaced Wattage

According to the ENERGY STAR® light output equivalency table, a 13 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Moreover, the wattage for old lamps was investigated for 13 watt CFL replacements and was found to be close to 60 W. Considering these elements, and the fact that the DA indicated that 13 watt CFLs are replaced by 60 watt incandescent lamps, the latter will be considered as the baseline for these products. As a result, the displaced wattage for 13 watt CFLs is 47 W.

### Hours of Operation

As for all ENSC residential programs, Econoler adjusted the daily usage of 13 watt CFLs, estimated at 2.4 hours based on participant declarations during a telephone survey, to 2.7 hours. This value is based on a metering study conducted for Hydro-Québec's residential lighting program<sup>5</sup>. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behavior factors can influence the respondents' answers. Hence, Econoler considers more accurate to use the daily usage of 2.7 hours from Hydro-Québec's metering study.

### Unitary Savings Calculation

The review resulted in a unitary savings value for 13 watt CFLs of 46.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 13 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 46.3 \frac{\text{kWh}}{\text{yr}}$$

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<sup>5</sup> For more details about CFL hours of operation, see Retail Markdown Program 2011 evaluation report.



#### 4.2.2 23 W CFLs

For 23 W CFLs, ENSC used a unitary savings value of 214 kWh per 23 W CFL installed in a non-residential building when savings could not be calculated based on the hours of operation and old product wattage value. For a residential building, the unitary savings value is of 41 kWh per 23 W CFL installed. These two values were revised for the 2011 evaluation.

##### 23 W CFLs Installed in Non-Residential Buildings

The unitary savings value used by ENSC for 23 W CFLs installed in non-residential buildings was obtained from the 2010 evaluation report. However, this report does not provide any detail on how the unitary savings value was obtained.

Econoler revised this savings value using an approach similar to the one presented in the OPA Prescriptive Measures and Assumptions report for this product, but with different hours of operation and displaced wattage values. The revision was conducted using the information available in the tracking sheet for 2011.

##### **Displaced Wattage**

The displaced wattage value was established based on the wattage value available in the tracking sheet for old products. This value was filled for 85 percent of the 23 W CFL installations. An average of 94.9 W was obtained for old incandescent bulbs by calculating the weighted average of the wattage value and the number of products installed, for all the projects where this value was available in the tracking sheet. Based on the average old wattage value, the displaced wattage value was calculated using the equation below.

$$\text{Displaced Wattage} = 94.9 \text{ W} - 23.0 \text{ W} = 71.9 \text{ W}$$

##### **Hours of Operation**

In 2011, Econoler established an average daily usage of 10.29 hours of operation per day for 23 W CFLs, based on the hours declared by site contacts during bulb installations by the DA.

##### **Unitary Savings Calculation**

The equation below presents the unitary savings calculation.

$$\text{Annual Unitary Savings} = \frac{71.9 \text{ W} \times 10.29 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 270.0 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value used for 23 W CFLs to

270.0 kWh per year.

### 23 W CFLs Installed in Residential Buildings

The 41 kWh unitary savings value used in the tracking sheet was obtained as presented above for 13 W CFLs installed in residential buildings.

### **Displaced Wattage**

The approach presented for 13 W CFLs installed in residential buildings was used for estimating the unitary savings value for 23 watt CFLs. ENSC indicated that 23 watt CFLs were used by the DA to replace 100 watt incandescent lamps as 75 watt incandescent lamps are rarely used in the NS market. Moreover, information collected from several 23 watt CFLs specification sheet indicated that manufacturers recommended using a 23 watt CFL to replace a 100 watt incandescent lamp, despite the fact that the ENERGY STAR light output equivalency table indicated that a 23 watt CFL provides the same light output (lumens) as a 75 watt incandescent lamp. The weighted average wattage of incandescent lamps replaced by 23 watt CFL is 93.5 watt. This value was used as the base case for this product, and corresponds to a displaced wattage of 70.5W.

### **Hours of Operation**

As for 13 watt CFLs installed in residential buildings, the daily usage of 23 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

### **Unitary Savings Calculation**

The review resulted in a unitary savings value for 23 watt CFLs of 69.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

### 4.2.3 Chandelier CFLs

For chandelier CFLs, ENSC used a unitary savings value of 22.63 kWh for each product installed in non-residential and residential buildings as chandeliers are typically installed in common areas like lobbies or dining rooms. This value was sourced from the 2010 OPA Prescriptive Measures and Assumptions report<sup>6</sup>, which was not revised by the OPA in the 2011 edition of the report. The products installed by the DA are 9 W chandelier CFLs.

The savings values proposed by the OPA consider a displaced wattage value of 20 W and 3.1 hours of operation per day. The hours of operation value was established for residential buildings.

Econoler revised this savings value using the information available in the tracking sheet, covering projects completed by September 2011.

#### Displaced Wattage

The displaced wattage value was established based on the wattage value available in the tracking sheet for old equipment. This value was filled for 85 percent of the chandelier CFL installations. An average of 43.6 W was obtained for old incandescent bulbs by calculating the weighted average of the wattage value and the number of products installed. Based on the average old wattage value, the displaced wattage value was calculated using the equation below:

$$\text{Displaced Wattage } 43.6 \text{ W} - 9.0 \text{ W} = 34.6 \text{ W}$$

#### Hours of Operation

In 2011, Econoler established an average daily usage of 9.34 hours of operation per day for chandelier CFLs, based on the hours declared by site contacts during bulb installations by the DA.

#### Unitary Savings Calculation

The following equation presents the unitary savings calculation.

$$\text{Annual Unitary Savings} = \frac{34.6 \text{ W} \times 9.34 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 118.0 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value for chandelier CFLs to 118.0 kWh per year.

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<sup>6</sup> Ontario Power Authority (OPA), "2010 Prescriptive Measures and Assumptions."

#### 4.2.4 Dimmable CFLs

For dimmable CFLs, ENSC used a unitary savings value of 123 kWh for each 14 W dimmable CFL installed in non-residential buildings and 41 kWh for each dimmable CFL installed in residential buildings.

##### 14 W Dimmable CFLs Installed in Non-Residential Buildings

The savings value used by ENSC for 14 W dimmable CFLs installed in non-residential buildings was obtained from the 2010 evaluation report. However, this report does not provide any detail on the how the unitary savings value was obtained.

Econoler revised this savings value using the information available in the tracking sheet for 2011.

##### **Displaced Wattage**

The displaced wattage value was established based on the wattage value available in the tracking sheet for the old equipment. This value was filled for 84 percent of the dimmable CFL installations. An average of 66.4 W was obtained for old incandescent bulbs by calculating the weighted average of the wattage value and the number of products installed. Based on the average old wattage value, the displaced wattage value was calculated using with the equation below.

$$\text{Displaced Wattage} = 66.4 \text{ W} - 14.0 \text{ W} = 52.4 \text{ W}$$

##### **Hours of Operation**

In 2011, Econoler established an average daily usage of 9.90 hours of operation per day for dimmable CFLs, based on the hours declared by site contacts during bulb installations by the DA.

##### **Unitary Savings Calculation**

The equation below presents the unitary savings calculation.

$$\text{Annual Unitary Savings} = \frac{52.4 \text{ W} \times 9.90 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 189.3 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value for chandelier CFLs installed in non-residential buildings to 189.3 kWh per year.

##### 14 W Dimmable CFLs Installed in Residential Buildings

The 41 kWh unitary savings value used in the tracking sheet was obtained as presented above for 13 W CFLs installed in residential buildings.

### Displaced Wattage

The approach presented for 13 W CFLs installed in residential buildings was used for estimating the unitary savings value for 14 watt dimmable CFLs. According to the ENERGY STAR light output equivalency table, a 14 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Thus, the replacement of a 60 watt incandescent lamp for a 14 watt dimmable CFL is considered as the base case for this product and corresponds to a displaced wattage of 46 W.

### Hours of Operation

As for 13 watt CFLs installed in residential buildings, the daily usage of 14 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

### Unitary Savings Calculation

The review resulted in a unitary savings value for 14 watt CFLs of 45.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 14 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 45.3 \frac{\text{kWh}}{\text{yr}}$$

#### 4.2.5 LED Exit Signs

For LED exit signs, ENSC used a unitary savings value of 253 kWh for each product installed in non-residential and residential buildings. This value was obtained from the 2010 evaluation report. However, this report does not provide any detail on the how the unitary savings value was obtained.

Econoler revised this savings value using the information available in the tracking sheet for 2011.

#### Displaced Wattage

The displaced wattage value was established based on the wattage value available in the tracking sheet for the old equipment. This value was filled for close to 79 percent of LED exit sign installations. An average of 38.8 W per kit (19.4 W per lamp) was obtained for old bulbs, using the weighted average of the wattage value and the number of products installed, for all projects where this value was available in the tracking sheet. Moreover, the wattage value for the exit sign retrofit kits used by the DA is 2.4 W.

Based on the average old wattage value, the displaced wattage value was calculated using the equation below.

$$\text{Displaced Wattage} = 38.8 \text{ W} - 2.4 \text{ W} = 36.4 \text{ W}$$

### Unitary Savings Calculation

LED exit signs operate 24 hours a day, or 8,760 hours per year. Based on this value, the unitary savings were calculated using the equation below.

$$\text{Annual Unitary Savings} = \frac{36.4 \text{ W} \times 24 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 318.9 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value used for LED exit signs to 318.9 kWh per year.

### **4.2.6 Power Bars with Integrated Timer**

For power bars with integrated timer, ENSC used a unitary savings value of 53.0 kWh for each product installed in non-residential and residential buildings. This value was provided to ENSC by Navigant Consulting and corresponds to the unitary savings established by the OPA in the 2010 Prescriptive Measures and Assumptions report, which was not revised in the 2011 edition of the report.

The approach used by the OPA is based on the type of device installed on the power bar as well as on the hours of use of each device. Savings for the power bars are generated by reducing the standby power consumption of electronic devices plugged into the power bar. Table 19 presents the data used by the OPA to calculate the unitary savings for power bars with integrated timer.

**Table 19: Unitary Savings Calculation for Power Bars with Integrated Timer**

| Parameters                      | Entertainment Centres | Computer Systems | Lighting   | Others     |
|---------------------------------|-----------------------|------------------|------------|------------|
| Proportion                      | 40.3%                 | 15.7%            | 19.4%      | 24.6%      |
| Average Wattage                 | 38.1 W                | 28 W             | 60 W       | 28 W       |
| Old Operating Time              | 9 h/day               | 14 h/day         | 6 h/day    | 11 h/day   |
| New Operating Time – with Timer | 5 h/day               | 8 h/day          | 3 h/day    | 4 h/day    |
| Operating Season                | 12 months             | 12 months        | 8.5 months | 8.6 months |
| <b>Annual Savings</b>           | <b>53.09 kWh</b>      |                  |            |            |

At the time of sampling for on-site visits, power bars with integrated timer accounted for only 0.6 percent of the total savings for the EP-DI program. As a result, no site visit was conducted for this

category of product. Thus, no information was collected on the devices installed on the power bars.

The type of devices plugged into the power bars and their hours of operation in facilities eligible for the EP-DI program could be different from the values established by the OPA for residential and small commercial facilities. However, the Evaluator does not have any information on these parameters that would allow a revision of savings. Thus, the unitary savings value for power bars with timer provided by the OPA was used for the 2011 impact evaluation. For the next evaluation, the Evaluator recommends that on-site visits be conducted at facilities where this equipment is installed. This will allow the collection of data from the devices installed on the power bars with integrated timer.

#### **4.2.7 Hot Water Tank Wraps**

For hot water tank wraps, ENSC used a unitary savings value of 399 kWh for each tank wrap installed in residential and non-residential buildings. This was obtained from the 2009 impact evaluation report of the Low Income Homeowner program, but was revised to reflect differences in water usage between residential and non-residential facilities.

##### Hot Water Tank Wraps Installed in Non-Residential Buildings

For non-residential buildings, the approach used to revise the unitary savings value is based on average energy savings and on information on tank size collected during the on-site visits.

## Average Energy Savings

The 2011 OPA Quasi-Prescriptive Measures and Assumptions report<sup>7</sup> presents energy savings for hot water tank wrap installations in different types of commercial facilities, on the basis of tank volume. These values are presented in the table below for the different sectors represented in the database where this product was installed through the EP-DI program. Based on this information, the average annual savings value for all types of facilities is 1.80 kWh/L of tank capacity.

**Table 20: Savings Values for Hot Water Tank Wraps**

| Sector                        | Annual Electricity Savings (kWh/L) |
|-------------------------------|------------------------------------|
| Office                        | 1.74                               |
| Food Retail                   | 1.70                               |
| Schools                       | 1.74                               |
| Restaurants                   | 2.10                               |
| Lodging                       | 1.74                               |
| <b>Average Annual Savings</b> | <b>1.80</b>                        |

## Hot Water Tank Volume

The OPA report shows the hot water tank volume for different types of commercial facilities. The average hot water tank size based on this information is 380 L (100 gal). The data collected during six on-site visits, indicate an average tank size of 250 L (66 gal). However, 3,984 hot water tanks were insulated in non-residential facilities for the year 2011. Considering this element, the average value presented by the OPA was collected instead of the value obtained from on-site visits.

It is to be noted that the DA met during tank wrap installations indicated that most installations had been performed on tanks of a capacity of 152 L (40 gal) and over, even though several installations had been carried out on smaller tanks. The EP-DI directives do not apply any threshold for the minimum tank size eligible for the installation. Considering this information, the average value obtained during the on-site visits was used to establish the unitary savings for hot water tank wrap installations.

For future evaluations, the Evaluator recommends that the DA collect information on the hot water tank volume. This will help provide a better estimate of energy savings for this product.

<sup>7</sup> Ontario Power Authority (OPA), "2011 Quasi Prescriptive Measures and Assumptions," <http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists>.



### Unitary Savings Calculation

The equation below details how the unitary savings were calculated.

$$\text{Annual Unitary Savings} = 1.80 \frac{\text{kWh}}{\text{L}} \times 380 \text{ L} = 684 \frac{\text{kWh}}{\text{yr}}$$

The EP-DI 2011 impact evaluation revised the unitary savings value used for hot water tank wraps installed in non-residential buildings to 684 kWh per year.

### Hot Water Tank Wraps Installed in Residential Buildings

The savings value used by ENSC was obtained from 2009 impact evaluation report of the Low Income Homeowner program.

As a second source, Econoler consulted the OPA report. In its 2011 version, the latter analyzed the installation of water heater blankets in the residential market.

The annual unitary savings for both single- and multi-family households were estimated at 270 kWh. Since the assumptions used by the OPA to estimate this unitary savings value are clear, well documented and reliable, Econoler used the unitary savings value of 270 kWh per year for this evaluation.

## **4.2.8 Commercial Programmable Thermostats**

For commercial programmable thermostats, ENSC uses a unitary savings value of 1,098 kWh for each product installed. This value was established by Navigant Consulting based on data from the Massachusetts Technical Reference Manual<sup>8</sup> and on data on the average surface area of a retail building provided by Statistics Canada. The line loss factor is also included in the unitary savings value. This approach considered average savings of 0.119 kWh per square foot of controlled space and an average surface area of 8,640 square feet.

The average savings per square foot value is provided for the installation of a programmable thermostat for heating in spaces with erratic existing control, which is adequate to estimate savings for the EP-DI program.

However, on-site visits conducted by ENSC in facilities where commercial programmable thermostats were installed through the EP-DI program indicated that the controlled space surface area is significantly lower than the values used by Navigant. An average value of 212 square feet of controlled space per programmable thermostat was obtained through the on-site visits.

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<sup>8</sup> Massachusetts Electric and Gas Energy, Massachusetts Technical Reference Manual for Estimating Savings from Energy Measures, 2011 Program Year – Plan Version.

Based on these values, the unitary savings value for commercial programmable thermostats used in the 2011 evaluation is calculated, as indicated below.

$$\text{Annual Unitary Savings} = 0.119 \frac{kWh}{ft^2} \times 212 ft^2 = 25.23 \frac{kWh}{yr}$$

For future evaluations, the approach presented by the OPA in the Quasi-Prescriptive Measures and Assumptions report could be used to estimate the energy savings for commercial thermostats. This approach is based on building simulations conducted for several building types in the commercial sector. In order to be able to use this approach, additional data need to be collected by the DA for each room where a programmable thermostat is installed. The Evaluator recommends collecting the following elements:

- > type of building section where the thermostat is installed (office, retail section, school, restaurant, food retail, warehouse, etc.);
- > conditioned floor area controlled by each thermostat, in square meters;
- > confirmation that the participant is planning to use the programmable thermostat for setback;
- > number of degrees Celsius of regular nighttime setback expected;
- > setback schedule (for example from 7 p.m. to 7 a.m.) and total number of hours per year for nighttime setback;
- > type of heating system (primary and secondary) used in the building section where the thermostat is installed and indication of which system is controlled by the thermostat.

Moreover, the DA should collect information on the type of thermostats installed at the facility before the retrofit and inquire on the use of manual nighttime setback with the old thermostat.

#### **4.2.9 Programmable Thermostats for Individual Rental Units of Multi-Unit Buildings**

For programmable thermostats, ENSC uses a unitary savings value of 63.15 kWh per year. This value comes from the OPA report. The baseline corresponds to a standard electronic thermostat. As a result, the energy savings are calculated from the temperature set back that can be set at night with a programmable thermostat. To do so, the OPA considered a saving value of 1 percent for every degree set back<sup>9</sup>.

For this year's evaluation, Econoler revised the unitary savings value used by ENSC, using the approach presented in the Retail Markdown program evaluation. First, Econoler had some doubts about the percentage of savings per degree of setback used by the OPA. The 1 percent savings per degree of setback comes from the U.S. Department of Energy and should be applicable to degree-

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<sup>9</sup> U.S. Department of Energy, Energy Savers – Thermostats and Control Systems, [www.energysavers.gov](http://www.energysavers.gov), Last update: 2011-09-02.

Fahrenheit and not to degree degree-Celsius like the OPA did. The percentage of savings per degree-Celsius of setback should be higher than for degree-Fahrenheit. Moreover, based on 2004 Industry data, the ENERGY STAR savings calculator for programmable thermostats assumes a 3 percent savings degree-Fahrenheit of setback (5.4 percent per degree-Celsius)<sup>10</sup>. Knowing that, Econoler suggests using another source of data for estimating the energy savings from the temperature set back on a programmable thermostat.

Secondly, the OPA uses a baseline corresponding to a standard electronic thermostat. However, the installers of programmable thermostats for the Multi-Unit Residential Renter (MURR) program revealed that the baseline in Nova Scotia's market should rather correspond to a bimetallic thermostat. Indeed, they explained that the programmable thermostats they install are mostly replacing bimetallic thermostats. The few electronic thermostats in place are not replaced by customers since they have often recently invested in it. This means that an additional savings can be applied for the accuracy of having an electronic thermostat instead of a bimetallic thermostat which uses on/off controls.

Econoler reviewed the 2009 evaluation of Hydro-Québec's Residential Electronic Thermostats in New Construction program<sup>11</sup> to adjust the unitary savings value used for programmable thermostats. This study estimated the energy savings generated by the thermostat accuracy and by the temperature set back. The Table 21 presents the results of this evaluation.

**Table 21: Main Outputs from Hydro-Québec's Evaluation of Electronic Thermostat Savings**

| Calculation Parameters                                                               | Apartment |
|--------------------------------------------------------------------------------------|-----------|
| <b>Gross Energy Savings for Electronic Thermostat Accuracy</b>                       |           |
| Percentage of savings due to the thermostat accuracy                                 | 4.5%      |
| Annual consumption for electric space heating (before thermostat installation) [kWh] | 4,782     |
| Savings per house [kWh]                                                              | 215       |
| Number of thermostats per house                                                      | 3.55      |
| Savings per thermostat [kWh]                                                         | 61        |
| <b>Gross Energy Savings for Temperature Setback with Programmable Thermostats</b>    |           |
| Savings per house [kWh]                                                              | 225       |
| Number of programmable thermostats per house                                         | 1.91      |
| Savings per thermostat [kWh]                                                         | 118       |

<sup>10</sup> ENERGY STAR, Programmable Thermostats for Consumers, Savings Calculator (Excel File), [www.energystar.gov](http://www.energystar.gov), Date of consultation: 2012-01-11.

<sup>11</sup> Econoler, "Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel," Final Report presented to Hydro-Québec, February 9, 2009.

For the savings calculation due to the electronic thermostat accuracy, the percentages of savings were based on research supervised by Hydro-Québec's laboratory of energy technologies (LTE)<sup>12</sup>. The research used test results made in LTE environmental chambers and in single-family homes by comparing the operation of bimetallic thermostats versus electronic thermostats and the consumption of houses with bimetallic thermostats versus electronic thermostats. The annual consumption for electric space heating was estimated through a billing analysis including 25,703 clients and 206,861 billing periods.

For the savings calculation due to the temperature setback, the savings per house was estimated based on a billing analysis regression which compared the consumption of houses with electronic thermostats and houses with programmable thermostats.

Since no details on how the unitary savings value provided by Navigant was obtained, Econoler considers more adequate to use the results from LTE tests conducted in environmental chambers and in single-family homes as well as the billing analysis from Hydro-Québec's evaluation report.

Thus, the total unitary savings value associated with the installation of a programmable thermostat is equal to 179 kWh per year. This value will be used in the 2011 impact evaluation of the RMP.

#### **4.2.10 Occupancy Sensors**

For occupancy sensors, ENSC used a unitary savings value of 391 kWh for each product installed through the program. This value was established by Navigant Consulting. However, no detail could be obtained on how this value was established.

At the time of sampling for on-site visits, the occupancy sensor category accounted for only 0.7 percent of program savings. Thus, no on-site visit was conducted for this category of product, resulting in no information on the total wattage of lamps controlled by occupancy sensors or on the hours of operation being collected.

Based on this information, the unitary savings value for occupancy sensors was not revised. However, considering that 3,502 occupancy sensors were installed in 2011, the Evaluator recommends conducting on-site visits to establish the total wattage of lamps controlled by occupancy sensors and the hours of operation as part of the next evaluation. It is worth noting that a minimum load criterion of 105 W must be enforced by the DA for each occupancy sensor installation. However, there is no minimal criterion for hours of operation.

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<sup>12</sup> Hydro-Québec – Laboratoire des technologies de l'énergie (LTE), "Sommaire exécutif de rapports publiés par Hydro-Québec concernant les économies d'énergie dues aux thermostats électroniques," October 2004.

#### **4.2.11 Dishwasher Spray Valves**

For dishwasher spray valves, ENSC uses a unitary savings value of 2,500 kWh per year. This value is based on two studies conducted by Veritec Consulting for the City of Calgary and for the Region of Waterloo in 2005 presenting savings values of 3,248 kWh per year and 1,762 kWh per year, respectively. The savings value used in the tracking sheet corresponds to the average of the savings values from these reports.

The savings values from the two reports produced by Veritec were obtained from site data on water usage reduction due to the use of efficient dishwasher spray valves.

These values are significantly lower than the 7,800 kWh savings value presented by Natural Resources Canada (NRCAN)<sup>13</sup> for pre-rinse spray valves. However, the NRCAN value is based on higher pre-rinse valve usage hours.

Since no on-site visit was conducted for dishwasher spray valves, no indication on the usage hours is available for EP-DI participants. Thus, the value used in the tracking sheet was not revised. However, as part of the next evaluation, the evaluator recommends collecting information on dishwasher spray valve usage, perhaps through on-site monitoring.

#### **4.2.12 Retail LED Direct Install Pilot Project Savings**

The Retail LED Direct Install pilot project includes 14 W and 17 W LED PAR lamps. These lamps are installed in small retail facilities as replacements for halogen lamps. A total of 254 installations were conducted under the Retail LED Direct Install pilot project.

Unitary savings values of 244 kWh and 292 kWh are used for 14 W and 17 W LED PAR lamps, respectively.

These unitary savings are calculated based on wattage displaced and 4,000 hours of operation per year, corresponding to typical hours for retail facilities. The displaced wattage values were obtained by considering a 70 W halogen PAR lamp as the baseline for 14 W LED PAR lamps and a 90 W halogen PAR lamp for 17 W LED lamps. Furthermore, for each installation, the PM adjusted the savings value based on the wattage value for the lamp replaced on-site by the DA, thereby reducing final energy savings. This adjustment was only conducted on 14 W LED PAR lamps. As for 17 W LED PAR lamps, all installations were in replacement for lamps matching the baseline wattage.

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<sup>13</sup> Natural Resources Canada, Warewashing Equipment – Commercial Dishwashers and Pre-Rinse Spray Valves, <http://oee.nrcan.gc.ca/commercial/equipment/commercial-kitchen/warewashing/12218>.

The savings in the tracking sheet provided for these products were not revised. The table below presents energy savings for each category of products installed through the pilot project. The total gross energy savings value for the pilot project is 4.27 GWh.

**Table 22: Gross Savings for Retail LED Direct Install Pilot Project**

| Product       | Number of Units Installed | Unitary Savings Value (kWh) | Adjustment for Existing Lamp Wattage Difference (kWh) | Total Gross Energy Savings (GWh) |
|---------------|---------------------------|-----------------------------|-------------------------------------------------------|----------------------------------|
| 14 W PAR LEDs | 5,654                     | 244                         | -77,804                                               | 1.30                             |
| 17 W PAR LEDs | 10,182                    | 292                         | -                                                     | 2.97                             |
| Total         | 15,836                    | -                           | -77,804                                               | 4.27                             |

#### 4.2.13 Installation Rate

For each site, the number of products installed was validated. In some instances, that number was different from the information in the savings tracking sheet. The installation rate is the ratio between the number of products installed and the number of products identified in the tracking sheet.

The installation rate was found to be 100 percent for all products, except for CFLs where a value of 65.7 percent was found. The installation rate for CFLs was calculated based on values collected for six sites representing eight installation jobs. The on-site visits were scheduled mainly for quality assurance; consequently, the number of on-site visits was established based on the percentage of total savings for which CFL installations accounted. Considering that only 12 on-site visits were to be carried out for all the measures implemented through the program, a total of seven on-site visits were conducted for CFLs, with data on the number of products installed collected for six sites. Overall, the tracking sheet contained 3,340 CFL installation jobs. With only six on-site visits where information on CFLs could be collected, an error margin of 28 percent with a confidence level of 90 percent was obtained for the CFL installation rate. This precision level is too low to draw any conclusion on the CFL installation rate. As a result, no savings adjustment was used in the current evaluation for the CFL installation rate. However, the Evaluator recommends investigating this matter further in future evaluations by increasing the number of visits conducted at sites which had CFLs installed in order to establish a more reliable installation rate value.

For occupancy sensors, power bars and dishwasher spray valves, the installation rate was considered to be 100 percent since no on-site visit was conducted for these categories. Moreover, no adjustment for the installation rate is applied to the savings for the pilot project.

#### **4.2.14 Energy-to-Demand Ratio**

Econoler calculated the total demand savings for the EP-DI program based on an energy-to-demand ratio of 9.94 GWh/MW. This ratio was obtained from the adjusted 2011 EP-DI program targets, by dividing the target energy savings by the target demand savings.

### **4.3 REVISED GROSS SAVINGS**

The annual gross savings for each category of products installed through the EP-DI program are presented in Table 23. They were calculated using the revised unitary savings and the installation rate established in the previous section. Overall, the total gross energy and demand savings amount to 27.318 GWh and 2.746 MW at the meter. The gross savings at generator level are also estimated in Table 23, using a line loss factor between the meter and the generator of 1.098. This value was calculated using the weighted average of the total energy savings for each customer rate class with the corresponding line loss factor value provided by Nova Scotia Power.

It results in total gross energy and demand savings estimated at 29.995 GWh and 3.017 MW at the generator.

**Table 23: Evaluation Results – Gross Energy and Demand Savings**

|                                                 | 13 W CFLs |        | 23 W CFLs |       | Chandelier CFLs | Dimmable CFLs |       | LED Exit Signs | Power Bars with Timer | Hot Water Tank Wraps |       | Programmable Thermostats |       | Occupancy Sensors | Dishwasher Spray Valves | Retail LED Direct Install Pilot Project |
|-------------------------------------------------|-----------|--------|-----------|-------|-----------------|---------------|-------|----------------|-----------------------|----------------------|-------|--------------------------|-------|-------------------|-------------------------|-----------------------------------------|
| Category of Product                             | Non-Res.  | Res.   | Non-Res.  | Res.  |                 | Non-Res.      | Res.  |                |                       | Non-Res.             | Res.  |                          |       |                   |                         |                                         |
| Energy Savings                                  |           |        |           |       |                 |               |       |                |                       |                      |       |                          |       |                   |                         |                                         |
| Number of Units                                 | 47,818    | 96,762 | 5,988     | 6,903 | 12,343          | 10,956        | 1,396 | 1,814          | 1,724                 | 3,814                | 2,153 | 6,816                    | 968   | 3,502             | 37                      | 15,836                                  |
| Unitary savings (kWh)                           | 150.7     | 46.3   | 270.0     | 69.5  | 118.0           | 189.3         | 45.3  | 318.9          | 53.1                  | 684.0                | 270.0 | 25.2                     | 179   | 391.0             | 2500.0                  | -                                       |
| Installation rate                               | 100%      | 100%   | 100%      | 100%  | 100%            | 100%          | 100%  | 100%           | 100%                  | 100%                 | 100%  | 100%                     | 100%  | 100%              | 100%                    | 100%                                    |
| Total Gross Energy Savings – at Meter (GWh)     | 7.206     | 4.480  | 1.617     | 0.480 | 1.456           | 2.074         | 0.063 | 0.578          | 0.092                 | 2.609                | 0.581 | 0.172                    | 0.173 | 1.369             | 0.093                   | 4.275                                   |
| Line Loss Factor                                | 1.098     | 1.098  | 1.098     | 1.098 | 1.098           | 1.098         | 1.098 | 1.098          | 1.098                 | 1.098                | 1.098 | 1.098                    | 1.098 | 1.098             | 1.098                   | 1.098                                   |
| Total Gross Energy Savings – at Generator (GWh) | 7.912     | 4.919  | 1.775     | 0.527 | 1.599           | 2.277         | 0.069 | 0.635          | 0.101                 | 2.865                | 0.638 | 0.189                    | 0.190 | 1.503             | 0.102                   | 4.694                                   |
| Demand Savings                                  |           |        |           |       |                 |               |       |                |                       |                      |       |                          |       |                   |                         |                                         |
| Energy-to-demand ratio                          | 9.94      | 9.94   | 9.94      | 9.94  | 9.94            | 9.94          | 9.94  | 9.94           | 9.94                  | 9.94                 | 9.94  | 9.94                     | 9.94  | 9.94              | 9.94                    | 9.94                                    |
| Total Gross Demand Savings – at Meter (MW)      | 0.725     | 0.451  | 0.163     | 0.048 | 0.146           | 0.209         | 0.006 | 0.058          | 0.009                 | 0.262                | 0.058 | 0.017                    | 0.017 | 0.138             | 0.009                   | 0.430                                   |
| Line loss factor                                | 1.098     | 1.098  | 1.098     | 1.098 | 1.098           | 1.098         | 1.098 | 1.098          | 1.098                 | 1.098                | 1.098 | 1.098                    | 1.098 | 1.098             | 1.098                   | 1.098                                   |
| Total Gross Demand Savings – at Generator (MW)  | 0.796     | 0.495  | 0.179     | 0.053 | 0.160           | 0.229         | 0.007 | 0.064          | 0.010                 | 0.288                | 0.064 | 0.019                    | 0.019 | 0.152             | 0.010                   | 0.472                                   |



## **4.4 INTERACTIVE EFFECTS**

Interactive effects are not taken into consideration by ENSC to calculate net savings but should be considered when space heating is electric. However, they were considered in the program evaluation.

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling systems. In the case of the EP-DI program, the replacement of regular lighting products with efficient lighting products, the installation of occupancy sensors and the installation on hot water tank wraps cause an increase in the heating load during winter and a decrease in the cooling load during summer. Interactive effects values were calculated for non-residential and residential facilities.

For all lighting products (CFLs, LED exit signs and LED PAR lamps) and occupancy sensors installed in non-residential facilities, a total interactive effects factor of -7.7% percent was used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work conducted in this study was intended to modify certain parameters in building simulations of commercial buildings in Quebec in order to determine the impact of these changes on heating and cooling systems. The simulations were performed with the DOE2 software and only focused on buildings heated entirely by electricity.

The following table presents the calculation details for the interactive effects in non-residential facilities. The values presented take into account the proportion of commercial buildings that are electrically heated and the proportion that are air conditioned. These proportions were obtained from the on-site visits conducted for all commercial and industrial (C&I) programs, except for the C&IC and Efficient Products-Direct Install programs. Data from the latter were excluded since the information collected on heating and cooling systems during the on-site visits for these programs were not representative of C&I facilities. C&IC program participants include a significant proportion of industrial customers, rendering the information collected difficult to use for other C&IC programs. Sites with electric heating systems were over-represented in the sample used for EP-DI on-site visits. Information for a total of 34 sites was collected to establish the interactive effects factor. For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&I telephone survey campaigns conducted by ENSC, and from each participant of the EP-DI program. This would provide for a better evaluation of the interactive effects factor.

**Table 24: Interactive Effects Factor for Lighting Products and Occupancy Sensors Installed in Non-Residential Facilities**

| Parameters                                   | % Non-Residential Buildings | Interactive Effects <sup>14</sup> |
|----------------------------------------------|-----------------------------|-----------------------------------|
| Electric heating with air conditioning       | 14.71%                      | -43.4%                            |
| Electric heating without air conditioning    | 8.82%                       | -49.0%                            |
| No electric heating with air conditioning    | 52.94%                      | 5.7%                              |
| No electric heating without air conditioning | 23.53%                      | 0.0%                              |
| <b>Weighted Interactive Effects Factor</b>   | -                           | <b>-7.7%</b>                      |

For lighting products installed in individual rental units of multi-unit residential buildings, the same approach was used to calculate the interactive effects factor. However, the proportion of residences in Nova Scotia that are heated electrically and that use air conditioning units or systems were obtained from ENSC<sup>15</sup> and Statistics Canada,<sup>16</sup> respectively. Table 25 presents the calculation details for lighting products installed in individual rental units of multi-unit residential buildings. The interactive effects factor calculated is -18.5 percent.

**Table 25: Interactive Effects Factor for Lighting Products Installed in Individual Rental Units of Multi-Unit Buildings**

| Parameters                                   | % of Residences             | Interactive Effects <sup>17</sup> |
|----------------------------------------------|-----------------------------|-----------------------------------|
| Electric Heating with Air Conditioning       | $33\% \times 18\% = 5.9\%$  | -54.4%                            |
| Electric Heating without Air Conditioning    | $33\% \times 82\% = 27.1\%$ | -58.0%                            |
| No Electric Heating with Air Conditioning    | $67\% \times 18\% = 12.1\%$ | 3.6%                              |
| No Electric Heating without Air Conditioning | $67\% \times 82\% = 54.9\%$ | 0%                                |
| <b>Weighted Interactive Effects Factor</b>   | -                           | <b>-18.5%</b>                     |

<sup>14</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

<sup>15</sup> ENSC from socket study.

<sup>16</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

<sup>17</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

For hot water tank wraps, an interactive effects factor value of -100 percent is considered during the heating season while an interactive effects factor value of +100 percent is considered during the cooling season. This is the case for hot water tanks located in rooms that are temperature controlled. In winter, all the heat released in the room by the non-insulated hot water tank is used for the heating load. Conversely, during the cooling season, this heat release needs to be compensated for in air-conditioned rooms, thus explaining the +100 percent interactive effects factor. Based on the heating and cooling degree-days for the region of Halifax<sup>18</sup>, Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation. Table 26 presents the detailed interactive factor calculation for hot water tank wraps installed in non-residential buildings while Table 27 presents the calculation for individual rental units in multi-unit residential buildings.

**Table 26: Interactive Effects Factor for Hot Water Tank Wraps Installed in Non-Residential Facilities**

| Parameters                                   | % of Non-Residential Buildings | Interactive Effects During Heating Period | Interactive Effects During Cooling Period |
|----------------------------------------------|--------------------------------|-------------------------------------------|-------------------------------------------|
| Electric heating with air conditioning       | 14.71%                         | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric heating without air conditioning    | 8.82%                          | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| No electric heating with air conditioning    | 52.94%                         | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No electric heating without air conditioning | 23.53%                         | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>   | <b>-</b>                       | <b>-15.8%</b>                             | <b>+11.5%</b>                             |
|                                              |                                | <b>-4.3%</b>                              |                                           |

<sup>18</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.

**Table 27: Interactive Effects Factor for Hot Water Tank Wraps Installed in Individual Rental Units of Multi-Unit Buildings**

| Parameters                                   | % of Residences | Interactive Effects During Heating Period | Interactive Effects During Cooling Period |
|----------------------------------------------|-----------------|-------------------------------------------|-------------------------------------------|
| Electric heating with air conditioning       | 5.9%            | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric heating without air conditioning    | 27.1%           | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| No electric heating with air conditioning    | 12.1%           | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No electric heating without air conditioning | 54.9%           | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>   | <b>-</b>        | <b>-22.1%</b>                             | <b>+3.1%</b>                              |
|                                              |                 | <b>-19.0%</b>                             |                                           |

The gross savings at the meter including interactive effects are presented in the table below.

**Table 28: Gross Savings at the Meter – Including Interactive Effects**

|                                                            | Savings for Non-Residential Buildings   |                 |                | Savings for Unitary Rental Units of Multi-Unit Buildings |                 |                |
|------------------------------------------------------------|-----------------------------------------|-----------------|----------------|----------------------------------------------------------|-----------------|----------------|
|                                                            | Lighting Products and Occupancy Sensors | Hot Water Tanks | Other Products | CFLs                                                     | Hot Water Tanks | Other Products |
| Total Gross Energy Savings                                 | 18.575                                  | 2.609           | 0.357          | 5.023                                                    | 0.581           | 0.173          |
| Total Gross Demand Savings                                 | 1.869                                   | 0.262           | 0.035          | 0.505                                                    | 0.058           | 0.017          |
| Interactive Effects Factor                                 | -7.7%                                   | -4.3%           | 0%             | -18.5%                                                   | -19.0%          | 0%             |
| Total Gross Energy Savings with Interactive Effects Factor | 17.145                                  | 2.497           | 0.357          | 4.094                                                    | 0.471           | 0.173          |
| Total Gross Demand Savings with Interactive Effects Factor | 1.725                                   | 0.251           | 0.035          | 0.412                                                    | 0.047           | 0.017          |

After applying the interactive effects to the savings for CFLs, LEDs, occupancy sensors and hot water tank wraps, the total gross energy savings at the meter for the EP-DI program were estimated at 24.737 GWh while the total demand savings at the meter were estimated at 2.487 MW.

## **4.5 NET-TO-GROSS RATIO**

The NTGR evaluation of the program is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on customers' decision to purchase program-eligible efficient products. These questions were included in the retailer interview.

This section presents the methodology used to transform responses to NTGR interview questions into a NTGR. For the program, the NTGR includes the assessment of two distortion effects: free-ridership and spillover. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{Net-to-gross ratio} = (1 - \% \text{ free-ridership} + \% \text{ spillover})$$

### **4.5.1 Free-Ridership**

In the program, free-ridership can occur when participants declare that they would still have purchased the efficient products in the absence of the program. The telephone survey included four free-ridership questions divided into four groups that attempted to assess:

- > if participant had any plans to install the energy-efficient products before learning about the EP-DI program;
- > the probability that the participant would have installed the same energy-efficient products if the rebate offered had not been in place;
- > the probability that the participant would have installed the standard efficiency products instead of energy-efficient products if the rebate offered had not been in place;
- > the probability that the participant would have installed the same energy-efficient products but at a later date if the rebate offered had not been in place;
- > the probability that the participant would have paid the full cost of installing energy-efficient products; and
- > the elements of the program that influenced the participant to install energy-efficient products.

Each group of questions are transposed into a level of program attribution which is used to calculate the overall free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix VII.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania.

The most important elements of the approach previously used to estimate the free-ridership level of the program were preserved in Econoler's approach. However, the enhancement below was incorporated by using:

- > A 0 to 10 scoring system.

- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced customer energy efficiency decision making. This question structure more accurately reflects the complex nature of real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Using this approach, survey results reveal a free-ridership level of 15.4 percent for the program in 2011. Conversely, the average free-ridership value obtained in 2010 was 17.5 percent.

#### **4.5.2 Spillover**

For the program, the internal spillover effects are measured through the participant survey. Internal spillover can occur when participants purchase eligible energy-efficient products following their previous participation in the program due to its influence, thereby showing the advantages of such products.

During the telephone survey, participants were asked if they had bought and installed additional energy-efficient products following their previous participation in the program. Additional questions were used to verify the eligibility of the additional purchases by asking:

- > If they have benefited from any other financing or incentive program for these additional purchases, or if they planned to submit a rebate request for these purchases in the future.

Subsequently, other questions were asked to verify the level of influence that the program had on the purchase.

Depending on the level of influence obtained during the survey, a portion of these savings was attributed to the program.

The level of internal spillover was calculated for each participant is based on the equation below.

$$\%SO = \frac{kWh \text{ associated with the additional purchase} \times \text{attribution level}}{\text{Total kWh savings for all the survey participants}}$$

The final level of internal spillover for the program is the sum of the internal spillover for each participant.

The level of internal spillover for this program is low. Only 12 participants out of the 70 surveyed were flagged for spillover. However, only four of them confirmed having purchased additional energy-efficient lighting products following their previous participation in the program. These additional purchases correspond to energy savings attributable to the program totalling 17.66 MWh, which represents a spillover level of 9.5 percent.

Using the free-ridership and spillover levels established, the NTGR value for the program is 0.94.

This value is used for all products installed through the EP-DI program. However, this value cannot be used for products installed under the Retail LED Direct Install pilot project. This pilot project covers relatively expensive products that have recently been introduced in the market. Thus, a NTGR of 1 was used for the Retail LED Direct Install pilot project.

## 4.6 NET SAVINGS

The net savings for the program were estimated using the NTGR value obtained above. The equation below was used to calculate the net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

This equation was used for both demand and energy savings. The results obtained are presented in the table below. For 2011, total net energy savings at the generator are estimated at 25.792 GWh while net demand savings at the generator are estimated at 2.593 MW.

**Table 29: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR         | Net Savings       |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|--------------|-------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |              |                   |
| Tracked Savings from ENSC | 35.678 GWh            | 35.678 GWh              | 35.678 GWh                                       | 0.83         | 29.435 GWh        |
| <b>Evaluation Results</b> | <b>29.995 GWh</b>     | <b>29.995 GWh</b>       | <b>27.161 GWh</b>                                | <b>0.95*</b> | <b>25.792 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |              |                   |
| Tracked Savings from ENSC | 3.589 MW              | 3.589 MW                | 3.589 MW                                         | 0.83         | 2.961 MW          |
| <b>Evaluation Results</b> | <b>3.017 MW</b>       | <b>3.017 MW</b>         | <b>2.731 MW</b>                                  | <b>0.95*</b> | <b>2.593 MW</b>   |

\* NTGR of 0.94 for EPDI program and NTGR of 1 for Retail LED Direct Install pilot project. The combined NTGR value for all savings is 0.95.

The net energy values calculated were compared to the program tracked savings for 2011. The net savings obtained were slightly lower than the values obtained from the tracking sheet. This can be explained by the adjustments made to the unitary savings values and the interactive effects factors applied to lighting and hot water tank wrap savings. Even though the program evaluation NTGRs were revised upward to 0.94 for EP-DI products and to 1 for the Retail LED Direct Install pilot project, compared to 0.81 and 0.9 respectively for tracked savings, the additional savings were not enough to compensate for the impact of the necessary adjustments mentioned.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Document the major characteristics of the program:</b> Specific explanations on the role of the DA and its sub-contractor as well as explanation on how the replaced products will be disposed of through the program should be explained in the program manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                               | <b>2. Provide a “base case”:</b> The program manual does not provide a “base case” that details information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                             |
|                               | <b>3. Provide the parameters used to estimate program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |
|                               | <b>4. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. The program manual content should be continually updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.                                                                                                                                                                                                                                       |
| <b>Program Tracking Sheet</b> | <b>5. Remove unnecessary fields:</b> The PM indicated that several fields in the tracking sheet are not required for program administration. Those fields are present even though they are not filled and should be removed for clarity purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b>            | <p><b>6. Ensure that all fields are filled in systematically:</b> Once the necessary fields are identified, it is recommended to ensure that they are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet. The analysis of the 2011 tracking sheet revealed that the rate code values for the facility where the products were installed were missing or not available for 20 percent of the records.</p> <p><b>7. Improve the labelling of the usage group field:</b> The usage group field is labelled as “Other” for almost 22 percent of the records. The list of usage groups provided to the DA should be expanded to facilitate the identification of the usage group for each facility, thereby limiting the usage of “Other.”</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Program Design and Implementation</b> | <p><b>8. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operations, which is usually easier to collect than it is during the evaluation stage as the latter can take place several months after the project is complete. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> <p><b>9. Standardize the program name across all channels:</b> Econoler understands that the program name should reflect its nature and that ENSC wants to make its mark in the market. Nevertheless, changing the commercial name of the program can only bring confusion in the market. Moreover, the commercial name of the program is “Part of the Solution” while the in-house monitoring name is “Efficient Products Direct Install.” The Evaluator’s recommendation is to limit changing names as much as possible and use the same name in all contexts.</p> |
| <b>ENSC Website</b>                      | <p><b>10. List all 10 products on the website for the benefit of participants:</b> Customers can consult the ENSC website to find relevant information regarding the EP-DI program, such as the list of proposed products. The website provides examples of six products covered by the program. The program manual includes, on page 34, 10 products. The Evaluator understands that the website only provides examples, but Econoler recommends listing all 10 products for the benefit of participants.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Participants Perspectives</b>         | <p><b>11. Focus on energy bill savings in program communications:</b> Since saving on energy costs is the most important motivation for participating in the EP-DI program, program communications should continue to focus on energy bill savings.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Participants Perspectives</b> | <p><b>12. Include more material to the marketing strategies:</b> The 2011 evaluation results highlight the main use of the delivery agent's call centre and one-on-one encounters as marketing tools to contact eligible businesses and promote the EP-DI program. Indeed, most participants have learned about the program from the actions of program staff or representatives. Very few participants have learned about the program through marketing material. However, both program partners and participants have shared their desire to improve program marketing and advertising. The present recommendation points out the necessity to explore other marketing strategies that include marketing material addressing both partner and participant requests for better, more effective marketing as well as for further information on the program in general.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Impact Evaluation</b>         | <p><b>13. Collect information on air conditioning:</b> Econoler recommends collecting and compiling information related to participants' use of air conditioning. This information would be useful to calculate the interactive effects factor.</p> <p><b>14. Conduct on-site visits where power bars with integrated timer are installed:</b> For the next evaluation, the Evaluator recommends that on-site visits be conducted at facilities where this equipment is installed. This will allow the collection of data from the devices installed on the power bars with integrated timer.</p> <p><b>15. Collect information on the hot water tank volume:</b> For future evaluations, the Evaluator recommends that the DA collect information on the hot water tank volume. This will help provide a better estimate of energy savings for this product.</p> <p><b>16. Collect additional information for each room where a commercial programmable thermostat is installed:</b> In order to be able to use the savings calculation approach presented by the Ontario Power Authority for commercial thermostats, additional information should be collected on the rooms where programmable thermostats are installed and on the settings of such thermostats.</p> <p><b>17. Conduct on-site visits to establish the hours of operation and the total wattage of lamps connected to occupancy sensors:</b> Based on this information, the unitary savings value for occupancy sensors was not revised. However, considering that 3,502 occupancy sensors were installed in 2011, the Evaluator recommends conducting on-site visits to establish the total wattage of lamps controlled by occupancy sensors and the hours of operation as part of the next evaluation. It is worth noting that a minimum load criterion of 105 W must be enforced by the DA for each occupancy sensor installation. However, there is no minimal criterion for hours of operation.</p> |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Impact Evaluation</b> | <p><b>18. Collect information on dishwasher spray valve usage:</b> Since no on-site visit was conducted for dishwasher spray valves, no indication on the usage hours is available for EP-DI participants. Thus, the value used in the tracking sheet was not revised. However, as part of the next evaluation, the evaluator recommends collecting information on dishwasher spray valve usage, perhaps through on-site monitoring.</p>                                                                                                                                                           |
|                          | <p><b>19. Increase the number of on-site visits conducted for the CFL category:</b> No savings adjustment was used in the current evaluation for the CFL installation rate. However, the Evaluator recommends investigating this matter further in future evaluations by increasing the number of visits conducted at sites which had CFLs installed in order to establish a more reliable installation rate value.</p>                                                                                                                                                                            |
|                          | <p><b>20. Collect information on the heating source and on the use of air conditioning equipment during the C&amp;I telephone survey campaigns as well as from each participant of the EP-DI program:</b> For future evaluations, the Evaluator recommends that information on the heating source <b>and</b> on the use of air conditioning equipment at participants' facilities be collected during the C&amp;I telephone survey campaigns conducted by ENSC, and from each participant of the EP-DI program. This would provide for a better evaluation of the interactive effects factors.</p> |

## APPENDIX II - FIRMOGRAPHICS

Two-thirds of 2011 respondents gave a valid response to a question regarding energy costs as a percentage of their annual operating budget. Similar to last year, energy costs accounted for an average of 18% of their annual operating budgets. Overall, energy costs accounted for less than 20 percent of the annual operating budgets for over one-half of respondents (55%). One-quarter of respondents (26%) report that energy costs are between 20 and 29 percent of the annual operating budget.

**Table 30: Energy Costs as a Percent of Annual Operating Budget**

| Energy Costs as a Percent of Annual Operating Budget* | Respondents |       |       |       |
|-------------------------------------------------------|-------------|-------|-------|-------|
|                                                       | 2008        | 2009  | 2010  | 2011  |
| <i>Sample Size</i>                                    | 35          | 23    | 40    | 47    |
| Less than 10%                                         | 20%         | 43%   | 28%   | 21%   |
| 10-19%                                                | 31          | 42    | 35    | 34    |
| 20-29%                                                | 20          | 2     | 13    | 26    |
| 30-39%                                                | 9           | 1     | 15    | 4     |
| 40-49%                                                | 11          | 6     | 3     | 9     |
| 50-59%                                                | 3           | 2     | 3     | 2     |
| 60-69%                                                | 6           | --    | 3     | 2     |
| 70-79%                                                | --          | --    | 3     | --    |
| 80-89%                                                | --          | 6     | --    | --    |
| 90-99%                                                | --          | --    | --    | --    |
| Average                                               | 21.4%       | 15.4% | 18.0% | 17.7% |
| *Don't knows removed from table                       |             |       |       |       |

The majority of respondents in the 2011 sample were concentrated in a few business types including lodging (25%), retailers (17%), food service (11%), service (7%), and recreation (6%).

**Table 31: Business Type**

| <b>Business type</b>                    | <b>Respondents</b> |             |             |             |
|-----------------------------------------|--------------------|-------------|-------------|-------------|
|                                         | <b>2008</b>        | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample Size</i>                      | 70                 | 67          | 74          | 70          |
| Lodging – including apartment buildings | 20%                | 33%         | 34%         | 25%         |
| Retail - other than mall                | 21                 | 21          | 10          | 17          |
| Food service                            | 6                  | 2           | 10          | 11          |
| Service                                 | 3                  | 5           | 3           | 7           |
| Recreation                              | --                 | 5           | --          | 6           |
| Office                                  | 11                 | 9           | 17          | 4           |
| Health care (inpatient)                 | --                 | --          | --          | 3           |
| Public assembly                         | 10                 | --          | 4           | 1           |
| Religious worship                       | 19                 | --          | --          | 1           |
| Food sales (grocery)                    | --                 | --          | --          | 1           |
| Agriculture                             | --                 | --          | 10          | --          |
| Warehouse or storage                    | 1                  | --          | 4           | --          |
| Enclosed or strip mall                  | 1                  | 7           | 4           | --          |
| Public order & safety                   | 1                  | --          | 3           | --          |
| Education                               | 4                  | 7           | --          | --          |
| Seniors' home                           | 1                  | 6           | --          | --          |
| Manufacturing                           | --                 | 2           | --          | --          |
| <b>Other/Missing (Count)</b>            | --                 | <b>4</b>    | <b>3</b>    | <b>16</b>   |

Six in 10 2011 respondents (60%) have fewer than five full time employees, and just under eight in 10 have fewer than 20 employees.

**Table 32: Full-time Equivalent Workers**

| Full-time Employees | Respondents |      |      |      |
|---------------------|-------------|------|------|------|
|                     | 2008        | 2009 | 2010 | 2011 |
| <i>Sample Size</i>  | 70          | 70   | 77   | 70   |
| Fewer than 5        | 54%         | 67%  | 57%  | 60%  |
| 5 to 9              | 11          | 14   | 16   | 9    |
| 10 to 19            | 16          | 6    | 9    | 9    |
| 20 to 49            | 11          | 3    | 5    | 13   |
| 50 to 99            | --          | 2    | 4    | 3    |
| 100 to 249          | 3           | 1    | 3    | 1    |
| 250 or more         | 1           | 2    | 1    | --   |
| Refused             | --          | --   | --   | 3    |
| Don't know          | 1           | 4    | 5    | 3    |

Eight in 10 (81%) of 2011 respondents reported that their businesses were independent and not part of a larger company.

**Table 33: Type of Company**

| Type of Company          | Respondents |      |      |      |
|--------------------------|-------------|------|------|------|
|                          | 2008        | 2009 | 2010 | 2011 |
| <i>Sample Size</i>       | 70          | 70   | 77   | 70   |
| Independent              | 69%         | 72%  | 82%  | 81%  |
| Part of a larger company | 31          | 26   | 18   | 14   |
| Government               | --          | 2    | --   | --   |
| Other                    | --          | --   | --   | 3    |
| Refused                  | --          | --   | --   | 1    |

## **APPENDIX III - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Direct Install Program (C&I)**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: 2010 Evaluation Report</b> |
|---------------------------------------|

Q: This program has changed names several times.

1. Small Business Energy Solution
2. Small Business Direct Install
3. Small Business Lighting Solution
4. Efficient Lighting Products Direct Install Program
5. Direct Install Program.

Q: Care to explain why all these changes?

#### **Page I**

Q: When they mention changes in the free-riders calculations, do they mean the methodology to calculate FR or the scores?

Q: In the program theory, what was expected from a free direct install program in terms of free-ridership?

#### **Page II**

DI-R1 – What is the status of this recommendation (email)?

#### **Page III**

DI-R4 – Lack of time for a free direct install seems strange? Did you explore this response?

**Page IV**

DI-R6 and DI-R7 – Q: What is the status on these 2 recommendations?

**Page V**

DI-39: Status?

**Page 2**

C: The objective of Market Transformation through a resource acquisition program will be difficult to reach, since it does not address the market but the participants

**Page 3**

Q: What was the justification for such a free direct install program in the small business sector?

Q: This program could also be considered as early replacement. Did you search this option? (Mind you it's not easy to calculate savings in an early retirement program)

**Page 6**

Q: Who are the representatives in the Logic Model? Is this a delivery agent?

Q: In your opinion, does the logic model need to be updated? (I don't think so) But there might be confusion between representative and delivery agent.

**Page 7**

C: Make sure that replaced lamps were functional before replacing them (they were not burned) to get an accurate calculation of the savings.

C: Interactive effects will have to be calculated and the source of space heating identified.

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

**Page 29**

C: The document revision table is a good practice for tracking changes. The name of the program, if modified, should also be included in this table.



Q: Care to tell us who the delivery agent is or are? What exactly are their roles and how many are they. This is to help us asking the proper questions for the process evaluation with your program partners.

**Page 34**

Q: The quality assurance measure is a good practice. Is there a form for the delivery agent to fill?

Q: Do we have the sources and variables that were used to calculate the gross presumed savings for each measure?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Is the delivery agent the same as the program representative?

Q: is there a process flow chart?

Q: Did you identify any particular barriers that justified the offering of that program? (Usually a program addresses a barrier)

Q: Is there a participant form?

Q: What do you do with equipment that has been replaced?

Q: Do you plan to do a post evaluation cost effectiveness test?

Q: Since this a new program, did you have an evaluation plan designed at the same time the program was designed?

Q: Will there be a detailed program marketing strategy along with performance indicators?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Any other subject the PM wishes to include in the process examination of the program partners and or participants.

Thank you very much for your time and cooperation.

## **APPENDIX IV - INTERVIEW GUIDE WITH DELIVERY AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Direct Install**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca)

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a – If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Direct Install Program**

**Q9- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other program partners or sub-contractors (Clean Nova Scotia) in this program?**

**Score:**

**Q9a – If your answer to question 9 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q10 – Who provides you with leads for potential participants?**

**Q11- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Q12- What is your opinion in regard to the program name that has changed many times since its first implementation (Small Business Direct Install, Part of the Solution, Efficient Lighting Products Direct Install Program and now Direct Install Program)?**

**Q13- What is your opinion in regard to program on-course modifications other than the name change (e.g., more products to install or any other modification)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion

**Q14- Did you receive any complaints from other parties involved in the delivery of that program?**

- ☐ Yes: If yes, which party was that? (Please do not mention names, just the position of the party.)
- ☐ No
- ☐ Don't know

**Q14a- What was the complaint about?**

**Q15 – In your opinion what are the main barriers to the implementation of this program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX V - PARTICIPANT SURVEY QUESTIONNAIRE**

### **PARTICIPANT QUESTIONNAIRE**

#### **EFFICIENT PRODUCTS – DIRECT INSTALL PROGRAM**

October 7, 2011

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

Hello, my name is \_\_\_\_\_ from CRA (Corporate Research Associates). I am calling on behalf of Efficiency Nova Scotia Corporation, as part of an evaluation study of their energy efficiency programs. Our records indicate that you or your organization recently participated in Efficiency Nova Scotia Corporation’s Direct Install Program. We would appreciate your cooperation in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. This survey would take about 15 minutes of your time. Is this a good time for you?

The Direct Install Program involves a representative coming to your organization and installing energy efficient products free of charge. The program is also known as “Part of the Solution”. Throughout the questionnaire, I will refer to it as the “Direct Install” program.

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

#### **Verification and Recall**

V1. Our records indicate that your organization participated in Efficiency Nova Scotia’s Direct Install Program. Is this correct?

1. Yes (Go to V3)
2. No



- V2. Is there someone else at your organization who would know about your organization's participation in Efficiency Nova Scotia's Direct Install Program?
1. Yes (Ask for name: \_\_\_\_\_ and telephone #: \_\_\_\_\_) (Thank and terminate. Schedule interview with best contact.)
  2. No (Thank and terminate)
- V3. Are you the person in your organization who is most knowledgeable about your experience with the Direct Install Program?
1. Yes (Go to P1)
  2. No
- V4. We would like to talk to the person who is the most knowledgeable about your experience with the Direct Install Program. Could you give me the name and telephone number of this person? [Probe this individual may be an engineer, equipment contractor, or utility account manager].
- Name: \_\_\_\_\_
- Telephone #: \_\_\_\_\_
- (Note: Thank and terminate call. Schedule interview with best contact regarding experience with the program.)

#### **Section P. Program Notoriety and Reasons for participating**

- P1. Did your organization participate in any other Efficiency Nova Scotia or Nova Scotia Power energy efficiency programs before participating in the Direct Install Program?
1. Yes
  2. No (Go to P4)
  98. (Don't know) (Go to P4)
  99. (Refused) (Go to P4)
- P2. Which programs did your organization participate in prior to the Direct Install Program? **(Ask respondent to specify program(s). If cannot recall the program names, ask respondent for a short description.)**
- a. \_\_\_\_\_

P3a. In what year did your organization participate in this program? **ACCEPT MULTIPLE YEARS**

PROBE: Was there another program that your company or organization participated in prior to the Direct Install Program?

b. \_\_\_\_\_

P3b. In what year did your organization participate in this program? **ACCEPT MULTIPLE YEARS**

PROBE: Was there another program that your company or organization participated in prior to the Direct Install Program?

c. \_\_\_\_\_

P3c. In what year did your organization participate in this program? **ACCEPT MULTIPLE YEARS**

1. Before 2000
2. 2000
3. 2001
4. 2002
5. 2003
6. 2004
7. 2005
8. 2006
9. 2007
10. 2008
11. 2009
12. 2010
13. 2011
98. (Don't Know)
99. (Refused)

P4. How did you learn about the Direct Install Program? [RANDOMIZE AND READ 1-9, THEN READ CODE 96] [ACCEPT MULTIPLE RESPONSES]

1. From a phone call from a Direct Install Program / program representative
2. From a visit from a Direct Install Program / program representative
3. From Direct Install Program literature I received in the mail
4. From Efficiency Nova Scotia's website
5. From an Efficiency Nova Scotia presentation
6. From an Efficiency Nova Scotia staff person
7. By a visit at my business by an Direct Install Program staff person

- 8. From a business associate or friend (word of mouth)
- 9. From someone who had previously participated in the Direct Install Program
- 96. Or some other way? (Please Specify: \_\_\_\_\_)
- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

P5. What was the SINGLE most important reason your organization chose to participate in the program? **(Do not read)**

- 1. (To take advantage of program incentives)
- 2. (To see what else I should be doing as part of a planned project)
- 3. (To save on energy costs/bills)
- 4. (To reduce maintenance costs)
- 5. (To improve existing lighting conditions)
- 6. (To find ways to reduce carbon footprint)
- 7. (To help protect the environment)
- 8. (To replace non-working equipment)
- 9. (Recommended by utility account rep)
- 1. (Recommended by contractor)
- 2. (Past participation in utility programs)
- 96. (Other (Please explain \_\_\_\_\_))
- 98. (Don't know/Don't recall) (Go to VA)
- 99. (Refused) (Go to VA)

**[DO NOT ASK IF P5=98 OR 99]**

P6. What was the SECOND most important reason your organization chose to participate in the program? **(Do not read – accept one response)**

- 1. (To take advantage of program incentives)
- 2. (To see what else I should be doing as part of a planned project)
- 3. (To save on energy costs/bills)
- 4. (To reduce maintenance costs)
- 5. (To improve existing lighting conditions)
- 6. (To find ways to reduce carbon footprint)
- 7. (To help protect the environment)
- 8. (To replace non-working equipment)
- 9. (Recommended by utility account rep)
- 10. (Recommended by contractor)

- 11. (Past participation in utility programs)
- 96. (Other (Please explain \_\_\_\_\_))
- 98. (Don't know/Don't recall)
- 99. (Refused)

### **Section VA. Verifications of Actions**

VA. According to our information, through its participation in the Direct Install Program, your organization had energy-efficient products installed in the facility located at [SERVICE ADDRESS] on [DATE INSTALLED]. When answering the survey questions, please take into account only this facility.

VA1. [IF SAMPLE VARIABLE CFL = 1] Do you recall having CFLs installed through the Direct Install program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

(If No: VA1a Are you sure? According to our records, you had CFLs installed for free through the Efficiency Nova Scotia program.)

- 1. Yes, had CFLs installed
- 2. No, did not have CFLs installed
- 98. (Don't know)
- 99. (Refused)

VA2. [IF SAMPLE VARIABLE HWTANKWRAP = 1] Do you recall having hot water tank wrap installed through the Direct Install Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

(If No: VA2a Are you sure? According to our records, you had hot water tank wrap installed for free through the Efficiency Nova Scotia program.)

- 1. Yes, had hot water tank wrap installed
- 2. No, did not have hot water tank wrap installed
- 98. (Don't know)
- 99. (Refused)

VA3. [IF SAMPLE VARIABLE THERMOSTATS = 1] Do you recall having thermostats installed through the Direct Install Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

(If No: VA3a Are you sure? According to our records, you had thermostats installed for free through the Efficiency Nova Scotia program.)

- 1 Yes, had thermostats installed
- 2 No, did not have thermostats installed
- 98 (Don't know)
- 99 (Refused)

[IF RESPONDENT ANSWERED 2, 98 OR 99 TO ALL THREE MEASURES, THANK AND TERMINATE]

**INSTRUCTION:**

**(FOR RESPONDENTS WITH MORE THAN TWO (“YES”) MEASURES VERIFIED IN VA1-VA3, CHOOSE AT RANDOM TWO MEASURES VERIFIED IN VA1-VA3. THE RESPONDENT WILL ANSWER ACCORDING TO THESE TWO MEASURES THROUGHOUT THE QUESTIONNAIRE WHEN IDENTIFIED LIKE SO: [MEASURE 1 or 2].)**

**(Note: IF THERE ARE TWO MEASURES VERIFIED IN VA1-VA3, RESPONDENT WILL AUTOMATICALLY ANSWER ACCORDING TO THESE TWO MEASURES. IF THERE IS ONLY ONE MEASURE VERIFIED IN VA1-VA3, RESPONDENT WILL ANSWER ABOUT THIS UNIQUE MEASURE ONLY.)**

**Section PP. Previous Purchases**

I want to remind you to answer based on the energy-efficient measure(s) that were/was installed in the facility located at [SERVICE ADDRESS] on [DATE INSTALLED].

PP1. Prior to your organization participating in the Direct Install Program had your organization purchased...

PP1a. [MEASURE 1]

- 1. Yes
- 2. No
- 98. (Don't know/Don't recall)
- 99. (Refused)

PP1b. [MEASURE 2]

- 1. Yes
- 2. No
- 98. (Don't know/Don't recall)
- 99. (Refused)

**Section IC. In-service CFLS**

**(ASK IF CFLS IS ONE OF THE MEASURES CHOSEN AT RANDOM)**

IC1. We will now talk about the CFLs you had installed through the program. Have you since that time removed any of the compact fluorescent light bulbs installed as part of the Direct Install Program?

- 1. Yes
- 2. No (Go to FR1)
- 98. (Don't know/Don't recall (Go to FR1))
- 99. (Refused) (Go to FR1)

**(ASK IF IC1 = 1)**

IC4. What was the SINGLE main reason you removed the compact fluorescent light bulb(s) from service? **(Do not read)**

- 1. (Bulb is too bright)
- 2. (Bulb is not bright enough)
- 3. (Don't like the overall quality of the light)
- 4. (Don't like the color of the light – it is too [Specify:\_\_\_\_\_])
- 5. (Delay in light coming on)
- 6. (Interference with radio, TV, other electronic devices)
- 7. (Light beginning to dim)
- 8. (Light flickers)
- 9. (Burned out)

- 10. (Broke)
- 11. (Doesn't fit properly)
- 12. (Didn't like appearance in fixture/bulb is ugly)
- 13. (Bulb contains mercury)
- 96. (Other [Specify \_\_\_\_\_])
- 98. (Don't know/Don't recall)
- 99. (Refused)

**(ASK IF IC1 = 1)**

IC5. What did you do with the compact fluorescent light bulbs you removed? PROBE: Anything else? DO NOT READ – ACCEPT MULTIPLE RESPONSES

- 1. (Threw away)
- 2. (Put them away, stored them)
- 3. (Gave them away)
- 4. (Installed them at another location)
- 96. (Other [Specify \_\_\_\_\_])
- 98. (Don't know/Don't recall)
- 99. (Refused)

**Section FR. Free-ridership**

**(FOR SECTION FR REPEAT FOR UP TO TWO MEASURES VERIFIED IN VA1-VA3.)**

The next questions will be about the [MEASURE 1] you had installed through the program.

FR1M1. Did your organization have any specific plans to install the [MEASURE 1] **prior to** talking with anyone about the Direct Install Program? (**Do not read**)

- 1. (Yes)
- 2. (No)
- 98. (Don't know/Don't recall)
- 99. (Refused)

**FR1aM1IF FR1M1=YES, THEN ASK:** I just want to make sure I understand - **Before** your participation in the Efficiency Nova Scotia Direct Install Program, you had already made the decision to install the [MEASURE 1]?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

Now I would like to ask you to consider what actions you would have taken in the absence of the Direct Install Program.

If your organization had not participated in the Direct Install Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” In the absence of the Program, would you have . . . DO NOT ACCEPT A RANGE – POSE FR2M1 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2aM1. ... installed exactly the same energy-efficient [MEASURE 1] equipment that you installed through the Program?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2bM1. ... installed standard [MEASURE 1] equipment instead of energy-efficient [MEASURE 1] equipment?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2cM1. ...installed the exactly same energy-efficient [MEASURE 1] equipment that you installed through the Program *but at a later date*?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2cM1 > 5, then ask:**

**[DO NOT ASK IF FR2cM1=98 OR 99]**



FR2ccM1. You indicated in your previous response that if the Direct Install program had not been available there was an [FR2cM1] in 10 likelihood that you would have installed the same lighting products *but at a later date*. Approximately how many months later would you have installed these products? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't know)
99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2ccM1 ANSWER IN MONTHS, READ:**

Would it have been within . . .

1. Less than 6 months?
2. 6 months to less than 1 year later
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3M1. If Efficiency Nova Scotia had not installed [MEASURE 1] for free, would you have paid the full cost of installing the [MEASURE 1]?

1. Yes
2. No
97. (Depends on the cost)
98. (Don't know)
99. (Refused)

FR4M1. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to install [MEASURE 1]? Using a scale from 0 to 10 where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to implement the energy-efficient products you installed through the Program. DO NOT ACCEPT A RANGE

| Factor<br>(READ AND RANDOMIZE)                                                   |                                                   |
|----------------------------------------------------------------------------------|---------------------------------------------------|
| a. Free [MEASURE 1]                                                              | ____ Response ____98 Don't Know ____99<br>Refused |
| b. Free Installation services                                                    | ____ Response ____98 Don't Know ____99<br>Refused |
| c. Information received during the initial contact by the program representative | ____ Response ____98 Don't Know ____99<br>Refused |

The next questions will be about the [MEASURE 2] you had installed through the program.

FR1M2 Did your organization have any specific plans to install the [MEASURE 2] **prior to** talking with anyone about the Direct Install Program? (**Do not read**)

- 1. (Yes)
- 2. (No)
- 98. (Don't know/Don't recall)
- 99. (Refused)

FR1aM2.IF **FR1M2=YES, THEN ASK:** I just want to make sure I understand - **Before** your participation in the Efficiency Nova Scotia Direct Install Program, you had already made the decision to install the [MEASURE 2]?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

Now I would like to ask you to consider what actions you would have taken in the absence of the Direct Install Program.

If your organization had not participated in the Direct Install Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.”. In the absence of the Program, would you have . . . **DO NOT ACCEPT A RANGE – POSE FR2M2 SEQUENCE IN ORDER/DO NOT RANDOMIZE**

FR2aM2....installed exactly the same energy-efficient [MEASURE 2] equipment that you installed through the Program?

\_\_\_ Response      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2bM2....installed standard [MEASURE 2] equipment instead of energy-efficient [MEASURE 2] equipment?

\_\_\_ Response      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2cM2....installed the exactly same energy-efficient [MEASURE 2] equipment that you installed through the Program *but at a later date*?

\_\_\_ Response      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2cM2 > 5, then ask:**

**[DO NOT ASK IF FR2cM2=98 OR 99]**

FR2ccM2.      You indicated in your previous response that if the Direct Install program had not been available there was an [FR2cM2] in 10 likelihood that you would have installed the same lighting products *but at a later date*. Approximately how many months later would you have installed these products? **DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE**

- 1      \_\_\_\_\_ months later
- 2      (Never)
- 3      (At the same time)
- 98.    (Don't know)
- 99.    (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within . . .

- 1.    Less than 6 months?
- 2.    6 months to less than 1 year later
- 3.    1 to less than 2 years later?
- 4.    2 to less than 3 years later?
- 5.    3 to less than 4 years later?
- 6.    4 or more years later?

- 7. (Never)
- 98. (Don't Know)
- 99. (Refused)

FR3M2. If Efficiency Nova Scotia had not installed [MEASURE 2] for free, would you have paid the full cost of installing the [MEASURE 2]?

- 1. Yes
- 2. No
- 97. (Depends on the cost)
- 98. (Don't know)
- 99. (Refused)

FR4M2. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to install [MEASURE 2]? Using a scale from 0 to 10 where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to implement the energy-efficient products you installed through the Program. DO NOT ACCEPT A RANGE

| <b>Factor</b><br><b>(READ AND RANDOMIZE)</b>                                     | <b>(a) Performance of Measure</b>              |
|----------------------------------------------------------------------------------|------------------------------------------------|
| a. Free [MEASURE 2]                                                              | ___ Response ___98 Don't Know ___99<br>Refused |
| b. Free Installation services                                                    | ___ Response ___98 Don't Know ___99<br>Refused |
| c. Information received during the initial contact by the program representative | ___ Response ___98 Don't Know ___99<br>Refused |

**Section SO. Spillover**

SO1. Now I'd like you to think of the time **since you participated** in the Direct Install Program. Has your organization purchased and installed any additional energy-efficient measures on its own for the facility located at [SERVICE ADDRESS]?

1. Yes
2. No [Go to S1]
98. (Don't know/Don't recall) [Go to S1]
99. (Refused) [Go to S1]

**SO2\_2. IF SO1= YES, THEN ASK:** I just want to make sure I understand - **After** you participated in the Direct Install Program, your organization installed additional energy-efficient measures on its own for this facility. Is that correct?

1. Yes ☐ SO3
2. No ☐ Go to S1
98. (Don't know) Go to S1
99. (Refused) Go to S1

Now, I will specifically talk about the additional energy-efficient measures your company installed on its own after participating in the Direct Install Program.

SO3. [IF SO2\_2 = YES] Have the additional energy-efficient measures implemented benefited from any other financing or rebate from any other *Efficiency Nova Scotia* program, or do you plan to submit a funding request to Efficiency Nova Scotia for these measures in the future?

1. Yes [Go to S1]
2. No
98. (Don't know [Go to S1])
99. (Refused) [Go to S1]

SO4. [IF SO3= 2 'NO'] I would like to know what are the additional energy-efficient measures that you have implemented on your own after participating in the Direct Install Program. Did you implement...

SO4a. CFLs of any kind?

1. Yes
2. No
98. (Don't know)

SO4b. Hot water tank wrap or pipe insulation?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4c. Programmable thermostats?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4d. Occupancy sensors?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4e. L-E-D Exit Signs?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4f. Intelligent power bars with timers?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4g. Other energy-efficient measures?

- 1. Yes
- 2. No
- 98. (Don't know)

- SO5. [IF SO3 = 2 'NO'] Did your experience with the energy-efficient products installed through the Direct Install Program influence your decision to install some or all of these additional energy-efficient products on your own? Please, give your answer on a scale of 0 to 10, where 0 indicates that the Direct Install Program “had no influence at all on your decision to install the energy-efficient products” and 10 indicates that the program was “extremely influential to your decision to install the energy efficiency products.” **[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

### **Section S. Satisfaction with Program, Products & Future Purchase Intentions**

- S1. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how satisfied are you with your experience of the following aspects of the Direct Install Program? [98 = Don't know/Don't recall] [RANDOMIZE A-H; THEN ASK I] **DO NOT ACCEPT A RANGE**
- a. Interaction and communication with contractors
  - b. Initial contact
  - c. Audit technician or contractor
  - d. On-site lighting audit
  - e. Scheduling and timing of the installation
  - f. The installation process
  - g. Installers or contractors doing installation work
  - h. Completion of project on schedule
  - I The program overall

### **(REPEAT S2 AND S3 FOR EACH MEASURE CHOSEN AT RANDOM)**

- S2\_M1. Overall, how satisfied are you with the [MEASURE 1] installed by the Direct Install Program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?
- 1. Very satisfied
  - 2. Satisfied
  - 3. Neither satisfied nor dissatisfied
  - 4. Dissatisfied
  - 5. Very Dissatisfied
  - 98. (Don't know)
  - 99. (Refused)

S3\_M1. [IF S2\_M1 = 4 OR 5] Why are you not satisfied with the [MEASURE 1]? [MULTIPLE MENTION, DON'T READ LIST]

**Light Quality for CFLs**

1. (Bulb is too bright)
2. (Bulb is not bright enough)
3. (Don't like the overall quality of the light)
4. (Don't like the color of the light—it is too [SPECIFY: \_\_\_\_\_])

**Function/Performance**

5. (Delay in light coming on)
6. (Interference with radio, TV, other electronic devices)
7. (Light beginning to dim)
8. (Doesn't work with dimmer switch/3-way switch)
9. (It flickers)
10. (Doesn't save energy)
11. (Not easy to use)
12. (Doesn't work well)

**Physical Limitations**

13. (Burned out)
14. (Broke)
15. (Doesn't fit properly)
16. (Don't like appearance/ ugly)
17. (Bulb is too heavy)
18. (Bulb contains mercury)
96. (Other [Specify \_\_\_\_\_])
98. (Don't know)
99. (Refused)

S2\_M2. Overall, how satisfied are you with the [MEASURE 2] installed by the Direct Install Program?  
Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

1. Very satisfied
2. Satisfied
3. Neither satisfied nor dissatisfied
4. Dissatisfied
5. Very Dissatisfied
98. (Don't know)
99. (Refused)



S3\_M2. [IF S2\_M2 = 4 OR 5] Why are you not satisfied with the [MEASURE 2]? [MULTIPLE MENTION, DON'T READ LIST]

**Light Quality for CFLs**

1. (Bulb is too bright)
2. (Bulb is not bright enough)
3. (Don't like the overall quality of the light)
4. (Don't like the color of the light—it is too [SPECIFY: \_\_\_\_\_])

**Function/Performance**

5. (Delay in light coming on)
6. (Interference with radio, TV, other electronic devices)
7. (Light beginning to dim)
8. (Doesn't work with dimmer switch/3-way switch)
9. (It flickers)
10. (Doesn't save energy)
11. (Not easy to use)
12. (Doesn't work well)

**Physical Limitations**

13. (Burned out)
14. (Broke)
15. (Doesn't fit properly)
16. (Don't like appearance/ ugly)
17. (Bulb is too heavy)
18. (Bulb contains mercury)
96. (Other [Specify \_\_\_\_\_])
98. (Don't know)
99. (Refused)

S4. On a scale of 1 to 5, where 1='not at all likely' and 5='very likely', how likely will your organization be to purchase energy efficient products when installing or replacing energy-using products for your organization in the future? [98 = Don't know/Don't recall]

---

**Section B. Barriers to Action & Recommendations for Improvements**

B1. Were there any challenges or barriers that your organization faced in implementing the energy efficiency measures provided through the program?

1. Yes
2. No [Go to B4]
98. (Don't know/Don't recall) [Go to B4]
99. (Refused) [Go to B4]

B2. What was the SINGLE most important barrier? **(Do not read)**

1. (Concern that actual bill savings would be less than estimated)
2. (Lack of information to make an informed decision)
3. (Too little incentive)
4. (Too much work required to obtain funding)
5. (Too little information about the program)
6. (Cost savings not worth the effort of applying)
7. (Approval takes too long)
8. (Lack of financing)
9. (Energy efficient equipment does not meet payback requirements)
10. (Decision made elsewhere)
11. (Do not own building – have to work through owner)
96. (Other (Specify: \_\_\_\_\_))
98. (Don't know/Don't recall)
99. (Refused)

B3. What was the SECOND most important barrier? **(Do not read)**

1. (Concern that actual bill savings would be less than estimated)
2. (Lack of information to make an informed decision)
3. (Too little incentive)
4. (Too much work required to obtain funding)
5. (Too little information about the program)
6. (Cost savings not worth the effort of applying)
7. (Approval takes too long)
8. (Lack of financing)
9. (Energy efficient equipment does not meet payback requirements)
10. (Decision made elsewhere)
11. (Do not own building – have to work through owner)
96. (Other (Specify: \_\_\_\_\_))
98. (Don't know/Don't recall)
99. (Refused)

- B4. On a scale of 1 to 5, where 1='not at all important' and 5='very important', how important is reducing energy usage to your organization? [98 = Don't know/Don't recall]
- B5. On a scale of 1 to 5, where 1='not at all important' and 5='very important', how important is managing energy costs to your organization? [98 = Don't know/Don't recall]
- B6. Approximately, what percent of your annual operating budget do energy costs account for? [998 = Don't know/Don't recall, 999=Refused] \_\_% **PROBE TO RECEIVE A SPECIFIC RESPONSE, AND ACCEPT A RANGE ONLY IF NECESSARY**
- B7. Do you have any suggestions on how to improve the Direct Install Program? Consider all aspects of the program: Process, marketing, interactions with utility staff, interactions with contractors, and program forms. PROBE: Anything else?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- B8. Would a figure illustrating the various steps to follow in order to participate in the Direct Install Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?
1. \_\_\_\_ Significantly
  2. \_\_\_\_ Somewhat
  3. \_\_\_\_ Slightly, or
  4. \_\_\_\_ Not at all
  96. (Depends on what the figure or illustration would have been)
  97. (This kind of document already exists)
  98. (Don't know)
  99. (Refused)

## Section HO. Hours of operation

Now we would like to talk to you about the operating hours of the facility located at [SERVICE ADDRESS].

HO1. What are the normal hours of operation of the facility for each day of the week? [7777=CLOSED / NOT OPEN] [9997= CANNOT ANSWER BECAUSE OF THE TYPE OF FACILITY, E.G. HOUSING, MULTI-UNIT PROPERTY] [9998=Don't know/Don't recall] [9999=Refused]

|              | Record 24 hour time        |                            |
|--------------|----------------------------|----------------------------|
|              | Opening Hour (0000 - 2400) | Closing Hour (0000 - 2400) |
| A. Monday    |                            |                            |
| B. Tuesday   |                            |                            |
| C. Wednesday |                            |                            |
| D. Thursday  |                            |                            |
| E. Friday    |                            |                            |
| F. Saturday  |                            |                            |
| G. Sunday    |                            |                            |

[GO TO F1 IF HO1=9997, 9998 or 9999] Go to F1 if the respondent is not able to answer HO1 in general.

HO2. Other than scheduled holidays (e.g. national holidays, Christmas, New Year, etc.) and regular days of the week that your business is closed (e.g. Closed Sundays), typically how many days of the year is your business closed?

\_\_\_ RECORD DAYS [999=Don't know/Don't recall] [IF DAYS = 0 GO TO F1]

HO3. Are there specific periods of the year that your business is closed?

1. Yes
2. No (Go to F1)
98. (Don't know/Don't recall) (Go to F1)
99. (Refused) (Go to F1)



HO4. Approximately, when are those periods? [RECORD MONTH AND DATE THE PERIOD STARTS AND WHEN IT ENDS. RECORD UP TO THREE PERIODS] [98 =Don't know/Don't recall]

PERIOD ONE.      From    \_\_\_\_ / \_\_\_\_    To        \_\_\_\_ / \_\_\_\_  
                         M M   D D                  M M   D D

PERIOD TWO.      From           /             To               /       

M M    D D                  M M    D D

PERIOD THREE. From      /      To      /       
MM DD MM DD

## Section F. Firmographics

F1. What is the main activity of the facility where the energy efficiency improvements were implemented? [DO NOT READ—BUT CONFIRM WITH RESPONDENT THAT THE CATEGORY YOU CHOOSE IS CORRECT]

1. Education
2. Food Sales (grocery)
3. Food Service (restaurant)
4. Health Care - Inpatient
5. Health Care - Outpatient
6. Health Care - Inpatient & Outpatient
7. Lodging
8. Mercantile – Enclosed and Strip Malls
9. Mercantile – Retail (Other than Mall)
10. Office
11. Public Assembly
12. Public Order and Safety
13. Religious Worship
14. Service
15. Warehouse and Storage
16. Manufacturing (Identify Industry Type \_\_\_\_\_ (e.g., chemical, food, paper, etc.))
17. Vacant
96. (Other, please specify: \_\_\_\_\_)
98. (Don't know/Don't recall)
99. (Refused)

F3. Approximately how many full-time equivalent workers are employed at this facility?

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or More
98. (Don't know/Don't recall)
99. (Refused)

F4. Is your organization independent, or part of a larger organization or company?

1. Independent
2. Part of a larger organization or company
96. Other (\_\_\_\_\_)
98. (Don't know/Don't recall)
99. (Refused)

END. Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## APPENDIX VI - ON-SITE VISIT PROTOCOLS

### SITE VISIT PROTOCOL DURING INSTALLATION

#### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Address \_\_\_\_\_

Telephone: \_\_\_\_\_

Delivery Agent name \_\_\_\_\_

#### 2 INSTALLATION INFORMATION

*Site info:*

*Site observation:*

| CFL                     | Number | Existing type | Existing number | Existing wattage | Existing operation hours | DA collects all required info? |
|-------------------------|--------|---------------|-----------------|------------------|--------------------------|--------------------------------|
| CFL 13                  |        |               |                 |                  |                          |                                |
| CFL 23 W                |        |               |                 |                  |                          |                                |
| CFL R30                 |        |               |                 |                  |                          |                                |
| CFL Chandelier          |        |               |                 |                  |                          |                                |
| CFL Dimmable            |        |               |                 |                  |                          |                                |
| LED Exit Kit            |        |               |                 |                  |                          |                                |
| Programmable Thermostat |        |               |                 |                  |                          |                                |
| Occupancy sensor        |        |               |                 |                  |                          |                                |
| Hot water tank          |        | Tank size:    |                 |                  |                          |                                |

DA collect follow up information (programmable thermostats info, future retrofits (T12)?

DA has enough products for the job?

DA has expertise to make installation?

Call center information accurate?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#### NOTES

## SITE VISIT PROTOCOL POST-INSTALLATION

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Econoler site number: \_\_\_\_\_

Business Name: \_\_\_\_\_

Site contact Name: \_\_\_\_\_

Person met during site visit: \_\_\_\_\_

ENSC Project name: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

|                   |             |                          |                  |                          |                           |                          |
|-------------------|-------------|--------------------------|------------------|--------------------------|---------------------------|--------------------------|
| Type of facility: | Retail:     | <input type="checkbox"/> | Church:          | <input type="checkbox"/> | Community facility:       | <input type="checkbox"/> |
|                   | Restaurant: | <input type="checkbox"/> | Multi-unit res.: | <input type="checkbox"/> | Other ( <i>Specify</i> ): | <input type="checkbox"/> |

### 2 BUILDING HEATING/COOLING SYSTEM DESCRIPTION

Heating Source: Please fill the table below for each heating source at the site

|                                  | Heating system 1 | Heating system 2 | Heating system 3 | Heating system 4 |
|----------------------------------|------------------|------------------|------------------|------------------|
| Heat source                      |                  |                  |                  |                  |
| Heating system type              |                  |                  |                  |                  |
| Heating system efficiency or COP |                  |                  |                  |                  |

Cooling system: Please fill the table below for each cooling source at the site

|                            | Cooling system 1 | Cooling system 2 | Cooling system 3 | Cooling system 4 |
|----------------------------|------------------|------------------|------------------|------------------|
| Cooling system type        |                  |                  |                  |                  |
| Cooling system SEER or COP |                  |                  |                  |                  |



### 3 FACILITY OPERATION HOURS AND LIGHTING USAGE

Facility occupancy schedule:

*Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

| Occupancy schedule                                                        | 1: Normal |         | 2 (specify): _____ |         | 3 (specify): _____ |         |
|---------------------------------------------------------------------------|-----------|---------|--------------------|---------|--------------------|---------|
|                                                                           | Weekdays  | Weekend | Weekdays           | Weekend | Weekdays           | Weekend |
| Number of day with regular schedule per year                              |           |         |                    |         |                    |         |
| Number of day with regular holidays schedule per year                     |           | ----    |                    | ----    |                    | ----    |
| Number of days with no occupancy per year (For example: seasonal closure) |           |         |                    |         |                    |         |
| Total number of day per year                                              | 261       | 104     | 261                | 104     | 261                | 104     |

Normal week/holidays lighting operation schedule (hours per day):

*Please fill the table below for each lighting schedule reported by the site contact as usage could vary for each section of the facility. Use additional sheets if necessary.*

| Schedule # | Lighting schedule                            | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|----------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours (for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |
| 2          | Operating hours                              |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |
| 3          | Operating hours                              |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |

## 4 MEASURES INFORMATION

*Note: The number of months could be used to estimate the % of the time with both cooling and lighting ON at the same time or both heating and lighting ON at the same time, (for example: 3 months of cooling per year).*

### CFL 13 W

*Note: For each section with CFL 13 W to be validated please fill this section of the form (make copies if necessary)*

|                                                                                                                      |       |      |       |                     |
|----------------------------------------------------------------------------------------------------------------------|-------|------|-------|---------------------|
| Measure location:                                                                                                    | <hr/> |      |       |                     |
| Date of installation ( <i>From database</i> ):                                                                       | <hr/> |      |       |                     |
| Date of installation ( <i>Contact Declaration</i> ):                                                                 | <hr/> |      |       |                     |
| Number – Baseline equipment ( <i>From database</i> ):                                                                | <hr/> | Inc. | <hr/> | Halogens <hr/> CFLs |
| Number – Existing equipment ( <i>Contact Declaration</i> ):                                                          | <hr/> | Inc. | <hr/> | Halogens <hr/> CFLs |
| Number – CFL 13 W installed ( <i>From database</i> ):                                                                | <hr/> |      |       |                     |
| Number – CFL 13 W installed ( <i>On-site validation</i> ):                                                           | <hr/> |      |       |                     |
| Power – Existing lighting [W] ( <i>From database</i> ):                                                              | <hr/> | Inc. | <hr/> | Halogens <hr/> CFLs |
| Power – Existing lighting [W] ( <i>Contact Declaration/On site validation</i> ):                                     |       | Inc. |       | Halogens <hr/> CFLs |
| Hours of use per year ( <i>From database</i> ):                                                                      | <hr/> |      |       |                     |
| Hours of use for equipment: <i>Indicate the corresponding schedule number for each section:</i>                      | <hr/> |      |       |                     |
| Hours of use for equipment: <i>Indicate the corresponding annual hours:</i>                                          | <hr/> |      |       |                     |
| Percentage of lights in this section that remains ON when the facility is unoccupied ( <i>Contact declaration</i> ): | <hr/> |      |       |                     |
| Percent of the time when both lighting and cooling are ON in this section ( <i>Contact declaration</i> ):            | <hr/> |      |       |                     |

**CFL 13 W**

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

\_\_\_\_\_

When were the lamps removed or when did they burn?

\_\_\_\_\_

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

\_\_\_\_\_

**CFL 23 W**

*Note: For each section with CFL 23 W to be validated please fill this section of the form (make copies if necessary)*

Measure location

\_\_\_\_\_

Date of installation (*From database*):

\_\_\_\_\_

Date of installation (*Contact Declaration*):

\_\_\_\_\_

Number – Existing equipment (*From database*):

\_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Number – Existing equipment (*Contact Declaration*):

\_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Number – CFL 23 W installed (*From database*):

\_\_\_\_\_

Number – CFL 23 W installed (*On-site validation*):

\_\_\_\_\_

Power – Existing lighting [W] (*From database*):

\_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

**CFL 23 W**

Power – Existing lighting [W] (*Contact Declaration/On site validation*):

\_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Hours of use per year (*From database*):

\_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding schedule number for each section (Contact declaration)*:

\_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding annual hours (Contact declaration)*:

\_\_\_\_\_

Percentage of lighting in this section that remains ON when the facility is unoccupied (*Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

\_\_\_\_\_

When were the lamps removed or when did they burn?

\_\_\_\_\_

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

\_\_\_\_\_

### Dimmable CFLs

*Note: For each section with Dimmable CFLs to be validated please fill this section of the form (make copies if necessary).*

Measure location: \_\_\_\_\_

Date of installation (*From database*): \_\_\_\_\_

Date of installation (*Contact Declaration*): \_\_\_\_\_

Number – Existing equipment for this facility  
 (*From database*): \_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Number – Existing equipment (*Contact Declaration*): \_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Number – Dimmable CFLs installed (*From database*): \_\_\_\_\_

Number – Dimmable CFLs installed (*On-site validation*): \_\_\_\_\_

Power – Existing lighting [W] (*From database*): \_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Power – Existing lighting [W] (*Contact Declaration/On site validation*): \_\_\_\_\_ Inc. \_\_\_\_\_ Halogens \_\_\_\_\_ CFLs

Power – Dimmable CFL [W] (*Site validation*): \_\_\_\_\_

Typical setting of the dimming switch [% of full power] (*Contact declaration*): \_\_\_\_\_

Hours of use per year (*From database*): \_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding schedule number for each section:* \_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding annual hours:* \_\_\_\_\_

Percentage of lighting in this section that remains ON when the facility is closed (*Contact declaration*): \_\_\_\_\_

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*): \_\_\_\_\_

### Dimmable CFLs

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

---

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

---

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

---

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

---

When were the lamps removed or when did they burn?

---

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

---

### Candelabra (chandelier) CFLs

*Note: For each section with Candelabra CFLs to be validated please fill this section of the form (make copies if necessary).*

Measure location:

---

Date of installation (*From database*):

---

Date of installation (*Contact Declaration*):

---

Number – Existing equipment for this facility (*From database*):

---

 Inc. 

---

 Halogens 

---

 CFLs

Number – Existing equipment (*Contact Declaration*):

---

 Inc. 

---

 Halogens 

---

 CFLs

Number – Candelabra CFLs installed (*From database*):

---

Number – Candelabra CFLs installed (*On-site validation*):

---

Power – Existing lighting [W] (*From database*):

---

 Inc. 

---

 Halogens 

---

 CFLs

Power – Existing lighting [W] (*Contact Declaration/On site validation*):

---

 Inc. 

---

 Halogens 

---

 CFLs

Power – Candelabra CFL [W] (*Site validation*):

---

Hours of use per year (*From database*):

---

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

---

Hours of use for equipment: *Indicate the corresponding annual hours:*

---

Percentage of lighting in this section that remains ON when the facility is unoccupied (*Contact declaration*):

---

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

---

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

---

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

---

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

---

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

---

When were the lamps removed or when did they burn?

---

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

---

### Exit sign LEDs

|                                                                                                                                              |               |               |               |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|
| Date of installation:                                                                                                                        | <hr/>         |               |               |
| Total number – Existing equipment ( <i>From database</i> ):                                                                                  | <hr/>         |               |               |
| Total number – Existing equipment ( <i>Contact declaration</i> ):                                                                            | <hr/>         |               |               |
| Total number – LED Exit signs ( <i>From database</i> ):                                                                                      | <hr/>         |               |               |
| Total number – LED Exit signs installed ( <i>On-site validation</i> ):                                                                       | <hr/>         |               |               |
| <i>Select up to 3 exit signs and for each, complete the following section:</i>                                                               | Exit sign # 1 | Exit sign # 2 | Exit sign # 3 |
| Measure location                                                                                                                             | <hr/>         | <hr/>         | <hr/>         |
| Type – Existing equipment before replacement ( <i>From database</i> ):                                                                       | <hr/>         | <hr/>         | <hr/>         |
| Type – Existing equipment before replacement ( <i>Contact declaration – Ask if they still have an existing equipment and double check</i> ): | <hr/>         | <hr/>         | <hr/>         |
| Power – Existing lighting [W] ( <i>From database</i> ):                                                                                      | <hr/>         | <hr/>         | <hr/>         |
| Power – Existing lighting [W] ( <i>Contact declaration/On-site validation</i> ):                                                             | <hr/>         | <hr/>         | <hr/>         |
| Power – LED installed [W] ( <i>From database</i> ):                                                                                          | <hr/>         | <hr/>         | <hr/>         |
| Power – LED installed on-site [W] ( <i>On-site validation</i> ):                                                                             | <hr/>         | <hr/>         | <hr/>         |
| Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:                                  | <hr/>         | <hr/>         | <hr/>         |
| When were the lamps removed or when did they burn?                                                                                           | <hr/>         | <hr/>         | <hr/>         |
| Is the facility manager planning to have them replaced? If, not why?                                                                         | <hr/>         | <hr/>         | <hr/>         |



### Exit sign LEDs

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

### Programmable thermostats

Date of installation (*From database*):

\_\_\_\_\_

Date of installation (*Contact Declaration*):

\_\_\_\_\_

Total number – Existing equipment (*Contact declaration*):

\_\_\_\_\_

Total number – Programmable thermostats (*From database*):

\_\_\_\_\_

Total number – Programmable thermostats (*On-site validation/Contact declaration*):

\_\_\_\_\_

Select up to 3 programmable thermostats and for each, complete the following section:

Thermostat 1

Thermostat 2

Thermostat 3

Measure location:

\_\_\_\_\_

Which section of the facility's heating system is controlled by the thermostat?

\_\_\_\_\_

Indicate the heating system number (based on the information collected in the heating system section):

\_\_\_\_\_

Locate the heating device and indicate its type (ex: baseboard, wall heater, etc.):

\_\_\_\_\_

### Programmable thermostats

Indicate the capacity of the heating device identified [W]:

\_\_\_\_\_

Is the thermostat always used in programmable mode? If not, what is the percentage of use in this mode?

\_\_\_\_\_

### Pipe and Tank Wrap

Date of installation (*From database*):

\_\_\_\_\_

Date of installation (*Contact Declaration*):

\_\_\_\_\_

Hot water heating source (*On-site validation*):

\_\_\_\_\_

Hot water system energy factor (*On-site validation*):

\_\_\_\_\_

% of electricity used for water heating (*Contact declaration*):

\_\_\_\_\_

Is the pipe insulated: YES/NO (*On-site validation*)?

\_\_\_\_\_

Length of pipe insulated [foot] (*On-site validation*):

\_\_\_\_\_

Diameter of pipe insulated (*On-site validation/Contact declaration*):

\_\_\_\_\_

Pipe material (*Contact declaration*):

\_\_\_\_\_

Is the tank insulated: YES/NO (*On-site validation*)?

\_\_\_\_\_

Tank capacity [gal] (*On-site validation*):

\_\_\_\_\_

Water heater model number (*On-site validation*):

\_\_\_\_\_

Hot water temperature (*Contact declaration*)

\_\_\_\_\_

## 5 SNAP BACK / SNAP FORWARD QUESTIONS

**ASK the following questions if CFLs are installed at this site:**

P11A. **Before** participating in the Efficient Products Program, approximately what percentage of your company's / organization's screw-base light sockets contained CFLs, or compact fluorescent lamps? [RECORD ONE NUMBER, NOT A RANGE. IF RESPONDENT GIVES A RANGE, RECORD MIDDLE VALUE, OR ROUND UP. IF 'DON'T KNOW,' PROBE FOR BEST GUESS TO NARROW IN ON A NUMBER.] [RECORD PERCENT] \_\_\_\_\_% [98 = Don't know/Don't recall]

P11B. **After** participating in the Efficient Products Program, approximately what percentage of your company's / organization's screw-base light sockets contained CFLs, or compact fluorescent lamps? [RECORD ONE NUMBER, NOT A RANGE. IF RESPONDENT GIVES A RANGE, RECORD MIDDLE VALUE, OR ROUND UP. IF 'DON'T KNOW,' PROBE FOR BEST GUESS TO NARROW IN ON A NUMBER.] [RECORD PERCENT] \_\_\_\_\_% [98 = Don't know/Don't recall]

**ASK the following question if LEDs are installed at this site:**

P11C. **Before** participating in the Efficient Products Program, approximately what percentage of your company's / organization's exit signs contained a CFL? [RECORD ONE NUMBER, NOT A RANGE. IF RESPONDENT GIVES A RANGE, RECORD MIDDLE VALUE, OR ROUND UP. IF 'DON'T KNOW,' PROBE FOR BEST GUESS TO NARROW IN ON A NUMBER.] [RECORD PERCENT] \_\_\_\_\_% [98 = Don't know/Don't recall]

## COMMENTS OR NOTES

## APPENDIX VII - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Efficient Products – Direct Install program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did your organization have any specific plans to install the energy-efficient products prior to talking with anyone about the program?                                                                                                                                                            | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to install the energy-efficient products that were installed through the program?                                                                                                                                    | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient products that were installed through the program? (Scale 0 to 10)                                                                                                                                               | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have installed standard products instead of energy-efficient products? (Scale 0 to 10)                                                                                                                                                                           | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Preliminary Score:</b>                                                                                                                                                                                                                                                                                                                      | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)</b>                                                                                                                                          |
| <b>PA1 Adjusted Score:</b>                                                                                                                                                                                                                                                                                                                         | <b>IF FR1 = 0% : PA1_pre / 2<br/>IF FR1 = 100% : PA1_pre</b>                                                                                                                     |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b and c = Program factors                                                                                                                                                                                                                                                             | FR4_P = MAX(a; b; c)                                                                                                                                                             |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>(10 - FR4_P) x 10%</b>                                                                                                                                                        |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient products that were installed through the program <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                    | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have installed these products?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>FR3.</b> If ENSC had not installed energy-efficient products for free, would you have paid the full cost of installing these products?                                                                                                                                                                                                          | IF 1. Yes: FR3 = 100%<br>IF 2 OR 9 : FR3 = 0%                                                                                                                                    |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>IF FR3 = 0% : FR2cc / 2<br/>IF FR3 = 100% : FR2cc</b>                                                                                                                         |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                        | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3)</b>                                                                                                                                      |

Subsequently, the final free-ridership level calculated for each participant was submitted to two inconsistency tests:

- > The first inconsistency test consisted in verifying if  $(FR2a - FR2b) \geq 30\%$ . In that case, the participant's answers to FR2a and FR2b represented an inconsistency and PA1 became equal to the smallest value between FR2a and FR2b. Otherwise, PA1 remained unchanged.
- > The second inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to FR3 represented an inconsistency and PA2 was removed from the final free-ridership calculation. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.



**ECONOLER**

160, rue Saint-Paul, bureau 200, Québec (Québec), Canada G1K 3W1 Tél. : +1 (418) 692-2592 Téléc. : +1 (418) 692-4899  
[www.econoler.com](http://www.econoler.com)



# **ENERGUIDE FOR EXISTING HOUSES PROGRAM**

## **IMPACT AND PROCESS EVALUATION 2011**

### **EFFICIENCY NOVA SCOTIA CORPORATION**



Final Report



February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the EnerGuide for Existing Houses (EEH) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and four delivery agents and energy auditors as well as on two on-site visits, 25 participant simulations and a telephone survey of 70 program participants.

## **PROGRAM OVERVIEW**

The EEH program provides financial incentives to homeowners to reduce electrical energy and fuel consumption. The incentives for measures targeted at reducing electricity consumption are provided by Efficiency Nova Scotia Corporation (ENSC) and are the focus of this evaluation, whereas incentives for measures that aim at reducing other fuel consumption are provided by the Province of Nova Scotia. However, ENSC acts as a single window for participants regardless of the energy source used for heating. The program also works in conjunction with Natural Resources Canada (NRCan), which reinstated its federal program in June 2011.

The program includes a pre-retrofit audit. The audit is conducted in order to examine the house, complete a blower door test and collect different information such as the levels of insulation (roof, wall, etc.), the type and quantity of doors and windows as well as the types of heating and hot water systems. Following that walk-through audit, proposed measures are calculated using a simulation tool, HOT2000, and submitted to the homeowner through a report. Once the measures have been implemented, a post-retrofit evaluation is conducted to assess the upgrades made and give the house an EnerGuide rating.

Since the end of October 2011, the EEH program has also included a pilot project for demonstrating the benefits of energy efficiency. This pilot project is divided into two components, namely Standard Direct Install and Direct Install Plus. For these pilot projects, the delivery agents installed energy-efficient products directly on site during program audit visits (Standard Direct Install) or through new visits to customers that had already participated in the program in the previous years (Direct Install Plus). The savings of these pilots are independent from the energy savings calculated using HOT2000.

The program (including the pilot project) aimed at achieving net electricity savings of 7.80 GWh and demand savings of 2.14 MW for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the EEH program demonstrated that the program includes all the necessary ingredients and is well adapted to each house that takes part in the program. The program had 1,494 participants for the year 2011, which constitutes a slight diminution compared to last year (1,516 participants). Nevertheless, it still represents a much higher number in comparison to the year 2009 (520). In terms of net energy savings, the program (including the two Direct Install pilot project components) generated 4.805 GWh at the generator, which represents a drop of more than 40 percent with respect to 2010 net savings (8.14 GWh).

### **Implementation of Measures**

The 2011 evaluation reveals that, similar to the 2010 results, the most recommended measures were respectively electronic programmable thermostats, pipe insulation for an electric water heater and electric water heater tank insulation. In the same order, these three measures were also the ones that have been implemented the most under the standard program process; i.e., excluding the measures installed through the two Direct Install pilot project components.

Not all measures recommended to homeowners are implemented. The main reason provided by participants for not installing one or some of the measures that had been recommended is the cost. Indeed, participants mentioned that the recommended measures were too expensive. This justification was the top reason in 2010 and 2009 as well.

### **Satisfaction**

Satisfaction towards the program is high among participants. Indeed, most participants expressed their satisfaction with the overall program and its various aspects. Extremely high levels of satisfaction were noted relative to the energy audits. The partners interviewed through the process evaluation also mentioned being satisfied with the program. However, their level of satisfaction regarding marketing and outreach activities was lower, with partners claiming that marketing efforts had been inconsistent throughout the responsibility and involvement changes underwent by the program.

Participants surveyed through the 2011 evaluation mentioned suggestions to improve the program. The main recommendation made by participants was to offer more information on the measures provided through the program. This element of improvement was also brought up by program partners during the in-depth interviews. They cited having received complaints from participants on the lack of information available on qualifying measures.

## Program Energy Savings

To calculate the gross savings of the EEH program in 2011, Econoler reviewed the gross savings estimated by ENSC using three key features. The latter were namely the savings per EnerGuide point increase, the savings generated in relation with the implementation of prescriptive measures as well as savings due to the installation of energy-efficient products in households in the framework of two Direct Install pilot projects.

More precisely, energy savings realized as a function of EnerGuide point increases are calculated through the comparison of the participant house EnerGuide ratings before and after project implementation. These ratings are calculated via building simulations based on data collected on site. In its impact evaluation, Econoler performed several simulation calibration analyses for fine-tuning the value of annual savings per EnerGuide point used by ENSC. As a result, this value has been adjusted from 1,047 kWh to 817 kWh saved per EnerGuide point. Additionally, Econoler modified a number of ENSC's unitary energy savings per prescriptive measure and per energy-efficient product implemented or installed under the pilot projects. These adjustments were made on the basis of national demand-side management (DSM) studies carried out in 2010 and 2011.

In its net savings calculations, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey. Through this analysis, Econoler found a free-ridership level of 31 percent, which is higher than that found in the 2010 evaluation (24%). This difference in free-ridership level may be partially due to the enhancements made to the approach for evaluating the free-ridership level. On the other hand, Econoler found very low spillover effects for this program, which translated into a spillover level of 1 percent. In comparison, the 2010 program evaluation did not find any spillover effect (0%).

The next table presents the key distortion effects calculated through the program impact evaluation.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

| <b>Distortion Effects</b> | <b>2011</b> |
|---------------------------|-------------|
| Free-Ridership Level      | 31%         |
| Spillover Level           | 1%          |
| Net-to-Gross Ratio        | 0.70        |

The evaluation revealed that the EEH program (including the pilot project) had generated net energy savings of 4.805 GWh and demand savings of 1.543 MW in 2011, as shown in the next table.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 8.506 GWh             | 8.506 GWh                              | 0.76        | 6.465 GWh        |
| <b>Evaluation Results</b> | <b>7.447 GWh</b>      | <b>6.864 GWh</b>                       | <b>0.70</b> | <b>4.805 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 3.226 MW              | 3.226 MW                               | 0.76        | 2.452 MW         |
| <b>Evaluation Results</b> | <b>2.364 MW</b>       | <b>2.204 MW</b>                        | <b>0.70</b> | <b>1.543 MW</b>  |

As per the last table, the evaluated net energy savings are lower than those tracked by ENSC by approximately 25 percent. This difference is mainly due to the adjustment made to the energy savings per EnerGuide point, from 1,047 kWh to 817 kWh saved per EnerGuide point. In addition, a number of unitary savings values related to the implementation of prescriptive measures were modified in accordance with up-to-date studies conducted at national level. Furthermore, Econoler made slight adjustments to the savings generated by the two pilot projects (Direct Install Standard and Direct Install Plus). Most of the unitary savings values used for the calculation of the two pilot project savings were revised upward, as shown in the next table.

**Table 3: Direct Install Products and their Associated Energy Savings**

| Pilot Project Component | Products                                    | Unitary Savings Values (kWh/year) |           |
|-------------------------|---------------------------------------------|-----------------------------------|-----------|
|                         |                                             | Tracked                           | Evaluated |
| Standard + Plus         | 13 W CFLs                                   | 41                                | 46.3      |
| Standard + Plus         | 23 W CFLs                                   | 41                                | 69.5      |
| Standard                | LEDs Less than 10 W                         | 32                                | 32.5      |
| Standard                | LEDs Greater than 10 W                      | 67                                | 32.5      |
| Plus                    | LED Bulbs                                   | 50                                | 32.5      |
| Plus                    | LED Nightlights                             | 26                                | 29.3      |
| Plus                    | Electric Kettles                            | 49                                | 49        |
| Plus                    | CFL Compatible Floor Lamps (CFL Torchieres) | 241                               | 69.5      |
| Plus                    | Faucet Aerators (kitchens and bathrooms)    | 86                                | 176.3     |
| Plus                    | Low-Flow Showerheads                        | 157                               | 377       |
| Standard + Plus         | Pipe Insulation                             | 74                                | 74        |
| Standard + Plus         | Hot Water Tank Wraps                        | 399                               | 270       |

Finally, the addition of interactive effects for lighting and hot water measures, along with the fact that the net-to-gross ratio (NTGR) calculated for 2011 (0.70) was lower than that calculated as part of the 2010 program evaluation (0.76), are two other reasons why the 2011 net evaluated savings are lower than their tracked counterparts.

With regard to net demand savings, the Evaluator relevantly adjusted ENSC's tracked savings, regardless of the fact that ENSC and Econoler used the same energy-to-demand ratio in their calculations. The reason for this is that Econoler adjusted significantly the unitary peak demand savings related to the installation of electric thermal storage (ETS) systems. Econoler deemed that the unitary demand savings used by ENSC were not realistic; consequently, the former conducted a short survey of building simulations to fine-tune the latter. As a result, these demand savings were reduced by more than 35 percent.

## RECOMMENDATIONS

Econoler finds that the EEH program is a good energy efficiency initiative that includes all the necessary ingredients to implement measures tailored specifically to the conditions of each house. The program includes good practices and reached a satisfactory level of energy savings. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 DSM programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- EEH-R1. Create a list of pre-approved contractors:** During the in-depth interviews, some of the program partners mentioned the contractors' deficient understanding of energy efficiency programs. The lack of experienced contractors to implement the measures is an important barrier to the program. Training contractors and establishing a list of pre-approved contractors should be part of the program components to reduce complaints and achieve program savings as closely as possible.
- EEH-R2. Maintain marketing efforts to show program continuation:** The program partners have shown concern regarding the future of the program and have brought up program continuation as the most important program barrier, considering the uncertainty of federal government involvement. The present recommendation points out the necessity to be proactive as far as marketing efforts are concerned and to maintain these efforts in order to reassure program partners as well as Nova Scotians that the Province is serious about the program, regardless of federal support.
- EEH-R3. Inform participants about expected customer savings:** Since the main reason cited by participants for not having implemented some measures recommended by the EEH program is that measures are too expensive, the Evaluator suggests informing the participants about the expected savings of their project, in terms of energy and money. This could be included in the pre-retrofit report with a view to reducing the perceived



cost barrier. This improvement would also fulfill the participants' request to have more information on the measures recommended as well as their main motivation for participating in the EEH program, savings on energy costs and bills. ENSC could also analyze the potential for developing an on-bill financing scheme for residential customers. This could help overcome the financial barrier related to the implementation of certain expensive energy efficiency measures.

- EEH-R4. Collect the building energy consumption data for each house:** The Evaluator recommends calculating the energy savings of each participant using the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the retrofitted house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.
- EEH-R5. Conduct a more thorough billing analysis to evaluate the overestimation of energy consumption by HOT2000 with better precision:** The billing calibration developed in the 2011 evaluation revealed that HOT2000 tends to overestimate the house energy consumption. In the future, the Evaluator proposes developing a more comprehensive billing analysis to calculate an adjustment factor with a higher accuracy level. Using all participants from 2009, 2010 and 2011, a billing analysis could compare one full year of pre- and post-implementation energy consumption data with a view to establishing an adjustment ratio by comparing the HOT2000 expected savings to the actual reduction in participants' energy bills.
- EEH-R6. Revise HOT2000 models on a random basis:** The Evaluator or the PM should review a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The number of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of EnerGuide rating by more than 40 points.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

Efficiency Nova Scotia Corporation's (ENSC) EnerGuide for Existing Houses (EEH) program encourages homeowners in Nova Scotia (NS) to improve the energy efficiency (EE) of their house. The program also extends to small multi-unit residential buildings (MURBs).

The program provides incentives from ENSC (funded by DSM ratepayer funding) for demand-side management (DSM) measures with a view to reducing electricity consumption. The program also provides incentives from the Province of Nova Scotia (funded by provincial taxpayers) for efficiency measures to reduce other fuel consumption. ENSC acts as a single window for participants regardless of the source through which savings are achieved. For the EEH program, the portion paid through DSM funds includes the post-retrofit evaluations (E Audit) conducted after March 31, 2011 and the measures related to electric savings only. The post-retrofit evaluations (E Audit) conducted before March 31, 2011 were paid by the Province.

The EEH program initially worked in conjunction with Natural Resources Canada's (NRCan) ecoENERGY Retrofit Homes program. However, in March 2010, NRCan ended its rebate offer a year earlier than anticipated. In June 2011, the Federal component of the EnerGuide program, including rebates, restarted. As part of the reinstatement of the Federal program, homeowners who had already been through the pre- and post-evaluation processes had the option of re-entering the program to complete additional retrofits and qualify for further rebates. On January 28, 2012, the federal program reached its goal of 250,000 participants and thus stopped accepting new registrations.<sup>1</sup> As planned, all retrofit renovations had to be completed by March 31, 2012, but the deadline for completing the post-retrofit evaluations was extended to June 30, 2012.

The EEH program of ENSC contracts with six delivery agents who provide services across Nova Scotia. To participate in the program, homeowners must contact one of the program delivery agents (DAs) to schedule a pre-retrofit evaluation (D Audit). For most homes, the cost of the pre-retrofit evaluation is \$150 plus tax<sup>2</sup>. A certified evaluator performs a comprehensive examination of the house, which includes a blower door test to determine air tightness. The evaluator also collects additional information such as the levels of insulation (roof, wall, etc.), the type and quantity of doors and windows as well as the types of heating and hot water systems. Once the walk-through audit is complete, a pre-retrofit report is sent to the homeowner within a few weeks. The report includes a pre-retrofit EnerGuide rating and outlines the effectiveness of optional upgrades. This EnerGuide rating

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<sup>1</sup> NRCan website, <http://oee.nrcan.gc.ca/residential/6551>, February 1, 2012.

<sup>2</sup> For houses in excess of 2,500 sq. ft, there is an additional charge of \$25 per 500 sq. ft, up to \$250.

along with the effectiveness of the proposed energy efficiency measures are calculated using a simulation tool developed by the federal government, namely HOT2000<sup>3</sup>.

The homeowner then has 18 months to complete the upgrades and schedule a post-retrofit evaluation (E Audit), which is already included in the original cost. During the post-retrofit evaluation, the evaluator verifies the upgrades that have been completed and performs another blower door test. Based on the results of the post-retrofit evaluation, a final EnerGuide rating is established and the house is eligible for program rebates depending on the EnerGuide rating difference between the initial and the final evaluations and the implemented prescriptive measures.

Since the end of October 2011, the EEH program included a pilot project for demonstrating the benefits of energy efficiency. This pilot project is separated into two components, namely Standard Direct Install and Direct Install Plus. The savings of these pilots are independent from the energy savings calculated using HOT2000. The products installed through the pilot projects are supplied by hardware stores which then invoice ENSC directly.

For the Standard Direct Install pilot project, the delivery agent (also called service organization), taking advantage of the audit D or E visit, brings a product package to the client's house and directly installs it. The product package consists of six feet of pipe wrap, electric domestic hot water tank wraps as well as up to five LEDs and as many CFLs. The service organization receives \$85 per full package direct install. The remuneration reflects the number of measures implemented. In detail, the delivery agent receives \$55 to install the tank and pipe wraps, and \$30 for installing the bulbs. ENSC would like that the Certified Energy Advisors reach an amount of at least \$60 of installed products per house.

The Direct Install Plus pilot project is dedicated to clients who have already participated in the EEH program. The delivery agent responsible for this pilot project uses its existing client list to propose installing energy-efficient products. The available product list is longer than that of the Standard Direct Install component: CFL bulbs, LEDs, electric kettles, faucet aerators, low-flow showerheads, as well as DHW pipe and tank wraps.

## **Target Market**

The EEH program targets all existing houses in Nova Scotia. The program uses the service organizations' current networks for promotion. The program also employs mainstream media advertising and social media marketing techniques to reach its target market.

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<sup>3</sup> HOT2000 is residential energy analysis software approved by Natural Resources Canada for calculating EnerGuide ratings. This software was developed by the Housing, Buildings, Communities and Simulation (HBCS) group of CanmetENERGY, a division of Natural Resources Canada.  
For additional information: [http://198.103.48.154/eng/software\\_tools/hot2000.html](http://198.103.48.154/eng/software_tools/hot2000.html).

## **Eligible Measures**

Through the standard EEH program, ENSC's contribution for the energy-saving portion of the program covers a series of DSM measures for the following electricity end-uses:

- > electrically heated buildings;
- > buildings with electric heating systems; and
- > buildings with electric hot water heating.

During the energy audits, the following DSM measures for envelope improvements to residences that use other sources of energy than electricity are also covered:

- > ceiling insulation;
- > exterior wall insulation;
- > exposed floor insulation;
- > foundation insulation;
- > basement insulation;
- > basement header insulation;
- > crawl space insulation;
- > air sealing;
- > doors, windows and skylights – heated space only; and
- > water conservation (non-electric).

For the two components of the EEH direct install pilot project, the eligible products to be installed are shown below.

**Table 4: List of Eligible Products Installed under the Pilot Project Components**

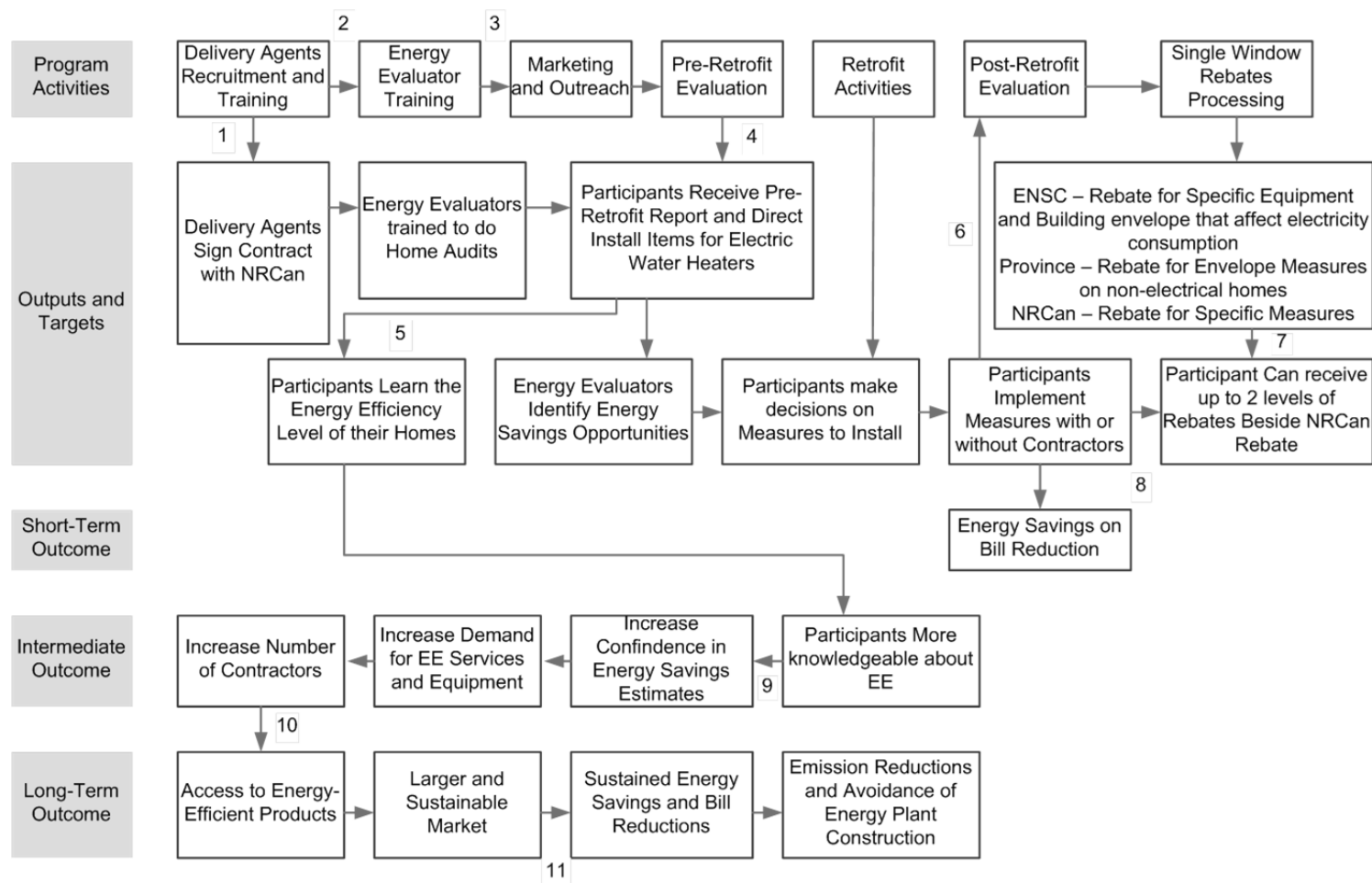
| Products                                    | Standard Direct Install Component | Direct Install Plus Component |
|---------------------------------------------|-----------------------------------|-------------------------------|
| 13 W CFLs                                   | ✓                                 | ✓                             |
| 23 W CFLs                                   | ✓                                 | ✓                             |
| LEDs Less than 10 W                         | ✓                                 |                               |
| LEDs Greater than 10 W                      | ✓                                 |                               |
| LED Bulbs                                   |                                   | ✓                             |
| LED Nightlights                             |                                   | ✓                             |
| Electric Kettles                            |                                   | ✓                             |
| CFL Compatible Floor Lamps (CFL Torchieres) |                                   | ✓                             |
| Faucet Aerators (kitchens and bathrooms)    |                                   | ✓                             |
| Low-Flow Showerheads                        |                                   | ✓                             |
| Pipe Insulation                             | ✓                                 | ✓                             |
| Hot Water Tank Wraps                        | ✓                                 | ✓                             |

The program and the two pilot project components aimed at achieving net electricity savings of 7.80 GWh and demand savings of 2.14 MW for the year 2011. The EEH program generated net electricity savings of 8.14 GWh in 2010 and 3.10 GWh in 2009.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: EnerGuide for Existing Houses Program Logic Model<sup>4</sup>**



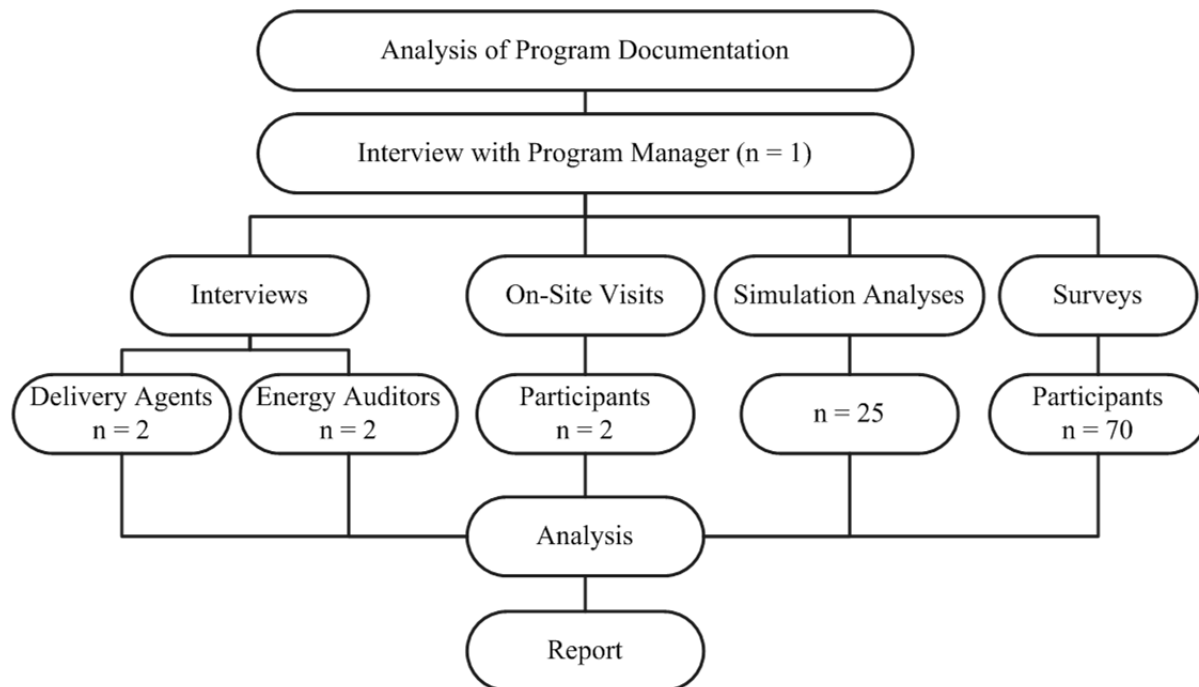
<sup>4</sup> The numbers 1 through 11 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices IV, V, VI and VII.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the EEH program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was obtained primarily from the following sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interviews for the process evaluation was finalized.

### **2.2.3 In-Depth Interviews with Program Partners**

#### **Interviews with Delivery Agents and Energy Auditors**

In September, four in-depth interviews were conducted with program delivery agents and energy auditors. These interviews were intended, among other things, to understand their involvement in the program, participation process and perception and satisfaction with the program.

### **2.2.4 On-Site Visits**

In November, two on-site visits were conducted at houses where measures from the EEH program had been implemented. The visits were conducted by Econoler's subcontractor, Philippe St-Germain, who is a certified ecoEnergy advisor. The sampling was established to include one D audit and one E audit. Furthermore, the selection included the evaluation of two different energy advisor companies.



These site visits were used to validate that program auditors were following the EnerGuide guidelines and that all pertinent information for running the house simulation with HOT2000 was collected.

The methodology used for the on-site visits under the EEH program is further explained in the program impact evaluation section of this report.

### **2.2.5 Simulations**

In November, 25 participant building simulations were reviewed under the impact evaluation of the EEH program. More precisely, the EEH program energy savings were estimated according to a protocol established by NRCan, which includes two HOT2000 simulations for each building (one for the existing building and another after the implementation of proposed energy efficiency measures). These reviews were used to validate simulation parameters in regard to the initial and final energy audits, as well as the different prescriptive measures implemented. The billing information for these 25 participants was also used to compare real annual consumption with the HOT2000 consumption and calculate an adjustment ratio.

### **2.2.6 Participant Survey**

A telephone survey with a total of 70 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October and November utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 19 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > how participants learned about the program;
- > participant motivations, concerns and barriers;
- > spillover and free-ridership;
- > impact of program measures; and
- > satisfaction with the program.

The demographic profile of survey respondents is shown in Appendix III. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2009, 2010 and 2011 telephone surveys.

**Table 5: Sample Size and Sampling Error**

| <b>Survey</b>     | <b>Population</b> | <b>Sample Size (n)</b> | <b>Sampling Error at 90% Confidence Interval</b> |
|-------------------|-------------------|------------------------|--------------------------------------------------|
| 2009 Participants | 520               | 23                     | ±17.3%                                           |
| 2010 Participants | 1,516             | 70                     | ±9.6%                                            |
| 2011 Participants | 1,494             | 70                     | ±9.6%                                            |

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the EEH program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on enhancing program performance.

The process evaluation was performed through in-depth interviews conducted with the PM and with the program partners, through on-site visits with participants as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The EEH program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what was found in the EEH manual.

**Table 6: Program Manual Content**

| Program Manual Content                                                                                       | EEH Program Manual |
|--------------------------------------------------------------------------------------------------------------|--------------------|
| Document revisions                                                                                           | ✓                  |
| Program description (including nature or type of program)                                                    | ✓                  |
| Program justification                                                                                        | ⊘                  |
| Program objectives                                                                                           | ✓                  |
| Incentives                                                                                                   | ✓                  |
| Eligibility criteria                                                                                         | ✓                  |
| Program partners and their roles                                                                             | ⚠                  |
| Program barriers                                                                                             | ✓                  |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ✓                  |
| Details about the savings calculations and type of measures                                                  | ⊘                  |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                       | EEH Program Manual |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Budget per year                                                                                                                                                                                                                                                                                                                                                              | ✓                  |
| Cost-effectiveness test results                                                                                                                                                                                                                                                                                                                                              | ✓                  |
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                                | ⊘                  |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                               | ⊘                  |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                              | ⊘                  |
| Program theory                                                                                                                                                                                                                                                                                                                                                               | ⊘                  |
| Logic model                                                                                                                                                                                                                                                                                                                                                                  | ✓                  |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                   | ✓                  |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                    | ✓                  |
| Program forms                                                                                                                                                                                                                                                                                                                                                                | ✓                  |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                    |

Econoler analyzed the EEH program manual. It contains relevant information useful for both the PM and the Evaluator. The following are recommendations in order to supplement and improve the tool:

> **Document important program assumptions or practices:**

- The program partners' specific roles and activities for a multi-component program should be described in detail in the program manual for future staff use.
- For auditor training, the program manual should explain which organization provides the training and its approach.
- The pre-retrofit evaluation ("D" Audit) is well explained in the program manual. However, the E and F types of audits (post-retrofit) could be further defined.
- All rebates should have a source as to how they were calculated (incremental cost, payback period, etc.) and be included in the program manual so that both the Evaluator and the PM can track any modifications and their justification.
- The unitary savings used for each prescriptive measure are available in the program tracking sheet. However, Econoler recommends adding this information in the program manual.

- > **Provide the parameters used to estimate the program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover an entire year of activities and be included in the program manual. The plans should also identify for each activity the performance indicators that should be collected for monitoring and evaluation purposes.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing that would allow it to serve as “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### 3.3 PROGRAM TRACKING SHEET

Econoler has reviewed the content of the tracking sheet for the EEH program. This tracking sheet is in fact an Excel spreadsheet used by the PM for program monitoring purposes.<sup>5</sup> In general, this tracking sheet is useful because it contains most information necessary for the PM to regularly monitor program savings. The necessary fields for program administration and evaluation purposes are present but some improvements could be made to make this tool a better asset for the PM and the Evaluator.

The tracking sheet is presented in one sheet. Each project has two unique identification numbers. One is the EnerGuide File Number and the other is the Utility Account Number. Using the EnerGuide File Number, the PM is able to request the HOT2000 files of the E audit from the NRCan database. The D audit can also be associated with the EnerGuide E-audit File Number. Likewise, the first two characters of the EnerGuide File Number can be used to identify which DA completed the audit. All customer information essential for conducting surveys was present in the tracking sheet.

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<sup>5</sup> As part of this program process analysis, the Evaluator did not review the EEH program data included in ENSC's online tracking system, namely the Demand Side Management Data System (DSMDS). At the time of writing this report, ENSC was working on the DSMDS to make it more accessible and to ensure that the information it contains is up to date.

All data necessary to calculate the estimated gross savings are included in the tracking sheet:

- > Initial and Final EnerGuide Ratings data come from the HOT2000 simulations developed by the Delivery Agent.
- > Evaluated EnerGuide point savings value. For 2011 projects, ENSC used 1,047 kWh of savings per EnerGuide point. This figure came from the 2010 program evaluation report.
- > Percentage of electric heat defined by the auditor and used in the HOT2000 simulations.
- > Individual measures (also known as prescriptive measures). For each measure, the quantity of equipment, the associated rebate and energy savings are presented. The energy savings data are based on the 2010 evaluation report.

The energy impact for each project is presented in various columns. Some of these detail energy savings in kWh and others detail electrical demand savings in kW.

The program tracking sheet was also evaluated by the PM during the interview. The PM considers that the tracking sheet contains a lot of relevant yet complex information that is difficult to understand, leaving room for improvement in terms of ease of use. Nevertheless, once the user understands it, the tracking sheet is still efficient to use.

The Evaluator believes that a number of adjustments could be made in the future to improve tracking sheet consistency and facilitate program evaluation. Therefore, the Evaluator recommends that ENSC:

- > **Delete fields pertaining to individual measure savings for which energy savings are included in the EnerGuide rating:** Currently, each measure has an associated field indicating the related annual energy savings. After analyzing HOT2000 simulations, only four of these measures did not seem to affect the EnerGuide rating. Consequently, the energy savings associated with these measures should be presented in separate columns. These measures are as follows: programmable electronic thermostats, electric water heater pipe wraps, drain water heat recovery (DWHR) with an efficiency below 42 percent and DWHR with an efficiency above 42 percent. The Evaluator suggests removing the fields that are not necessary to calculate energy savings including the “estimated kWh savings for individual measures” column to facilitate understanding of the tracking sheet.
- > **Add the period or end date of the renovation:** During the program impact evaluation process, the Evaluator made an adjustment to HOT2000 simulation outputs as a result of a billing calibration on a sample of projects. For future program evaluations, it would be beneficial to add the renovation completion date of each project in the tracking sheet since this information is very important when conducting a billing calibration. As mentioned further below in this report, Econoler recommends that ENSC conduct a more thorough billing analysis to evaluate the overestimation of the simulated household consumption after the implementation of energy efficiency measures, which would then allow for the comparison with the

overestimation calculated prior to the implementation of energy efficiency measures. The end date of the renovation would be very useful when performing such an analysis.

- > **Add the type of project:** Two kinds of projects are included in this program: existing houses and small multi-unit residential buildings (MURB). The PM ought to include this information in the tracking sheet to follow program development for each project type.
- > **Create fields for building energy consumption data:** Currently, the energy savings are calculated using the EnerGuide rating. It would be suitable and more accurate to calculate them with the energy consumption data of HOT2000. Econoler proposes adding fields for building energy consumption per year in kWh for D and E audits.
- > **Ensure that all fields are systematically filled in:** Once the necessary fields are identified, it is recommended there be a process to ensure they are systematically filled in. A protocol could be implemented to ensure that all information is collected and entered in the tracking sheet. Even if the percentage of missing entries for the EnerGuide rating is quite low for 2011 (only 3%), the Evaluator cannot provide ENSC with gross energy savings for these projects.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, the Evaluator concludes that the EEH program is a good energy efficiency initiative that includes all the necessary ingredients to implement measures tailored specifically to the condition of each house. There are three possible incentive sources in this program: NRCan (funded by the Federal Government), ENSC (funded by DSM ratepayer funding) and the Province of NS (funded by provincial taxpayers). While NRCan operates on its own, ENSC acts as a single window for taxpayers and for rate payers. This is an excellent initiative as long as this does not complicate the participant process.

The program uses a good approach to monitoring the baseline and the post-retrofit results for each audit. Moreover, the risk of double-counting savings with some measures (heat pumps, solar systems, water tank insulation) is taken into consideration by the PM by cross-referencing the projects. The fact that the customer must pay a minimal fee of \$150 for the pre-retrofit evaluation is a good practice because it discourages homeowners who do not intend to complete upgrades from participating.

In 2011, the program improved the participation process by developing a participant process flow chart that illustrates the steps of the EEH program. This will make the program participation procedures clearer for participants. Econoler has identified potential means of improving program design and implementation. The following are comments and recommendations that would have an impact on the design and delivery of the program.

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will ensure that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Strengthen the partnership with the DAs:** In 2011, ENSC enhanced the involvement of DAs in the program process. Nevertheless, interviews with DAs suggested that there is still room for improvement in this matter. During these interviews, the DAs proposed, among other things, that they could be notified in advance of any major modifications to the program or could be consulted about potential EE measures to be included in the program.
- > **Create a list of pre-approved contractors:** The lack of experienced contractors to implement the measures is an important barrier to implementation. Training contractors and establishing a list of pre-approved contractors should be part of the program components to reduce complaints and achieve program savings as closely as possible.
- > **Inform the participants about the expected savings of their projects:** One of the program barriers is that measures are too expensive to implement. Participants look at the up-front capital without realizing that the savings are present for the useful life of the measure. Savings calculations based on the duration of the measure (and not only the simple payback period) may be incorporated in the report and explained to participants as an educational component so that they can appreciate the true value of the savings. ENSC could also analyze the potential for developing an on-bill financing scheme for residential customers. This could help overcome the financial barrier related to the implementation of certain costly energy efficiency measures at residential level.

### **3.5 ENSC WEBSITE**

Customers can consult the ENSC website to find a large amount of information regarding the EEH program such as how the program works, the program contacts and the rebate guide. Although the information available on the website is clear and explicit in general, Econoler recommends the following adjustments to improve the communication tool:



- > **Facilitate the understanding of the participation process by clarifying the difference between steps 3 and 4:** In the “Enroll in the Program” section found on the website (MURB component) as well as in the “How to Take Part” section of the Rebate Guide, the difference between steps 3 and 4 is not clear. Both steps take place when the assessment after retrofit has been completed. These sections could be revised for better understanding.
- > **Provide examples:** In the “Enroll in the Program” section found on the website (MURB component), there are multiple rebates for different situations and it is not easy to assimilate. For instance, at the end of that section, it could be useful to simplify the description of how the rebate works, especially for step 5.
- > **Clarify the maximum rebate amount:** A maximum rebate amount of \$6,000 per home is mentioned in the Rebate Guide found on the website. The program manual indicates that “the homeowner can only receive a rebate up to the maximum funding available which is \$1,500 provincial per house, and \$5,000 in federal rebates.” The program manual also indicates that there is no maximum rebate amount per house for electricity DSM. This information could be confusing and misleading and should be clarified in the program literature, including the website.

### **3.6 ON-SITE VISITS**

The on-site visits conducted as part of the evaluation of the EEH program are used to assess the procedure and the ecoEnergy protocol that the energy advisors have to follow during audits. The ecoEnergy protocol was established by NRCan to provide a framework for energy auditors with the ecoEnergy certification. The D and E audits must be conducted by a certified ecoEnergy advisor who answers any questions about energy use in the home, gathers information for identifying potential energy efficiency measures, and collects energy bills and receipts. Each parameter that will, afterwards, be used in the HOT2000 models has to be documented and the procedure must be explained clearly to the participants.

During the two on-site visits, the Evaluator noted that the advisors followed EcoEnergy protocol procedures well. Key data were collected and pertinent information was delivered to the participant. Nevertheless, the Evaluator identified a number of opportunities for improving advisor on-site visit effectiveness.

The main issue identified by the Evaluator is related to the approach used for performing the blower tests. It is important to follow the protocol down to the last detail to ensure that the data collected are accurate and consistent for all audited buildings. During the two site visits, the blower door opening (fan hole) was left opened during the initial depressurization test, which assesses pressure differences caused by wind fluctuations. Moreover, internal and external temperatures were not taken systematically when conducting the blower door tests. In some cases, the temperature was taken a

few hours before the test, on a different site. These two bad practices (keeping the fan hole opened during the initial test and not taking the temperature on site at the time of testing) may lead to biased test results. Other than that, the blower door tests were generally performed properly, both advisors making sure that openings of air exchanger units were fully opened during the test.

Taking into account the findings of the two on-site visits, the Evaluator recommends to:

- > **Explain in detail the protocol to the clients:** The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations, etc.). Participants may have difficulties understanding a number of these concepts.
- > **Document house parameters:** The architectural elements of the houses (building faces, foundation and roof) should be photographed in order to keep a record and create more precise HOT2000 models. This is especially true when the simulations are made at a certain time upon completion of the site visit. This practice also allows for the verification of simulation data entries by a third party who has not been on site.
- > **Enforce the protocol procedures for performing blower door tests:** In light of the on-site visits conducted, the Evaluator identified two relevant mistakes in conducting the blower door tests, namely advisors did not block the blower door opening during the initial test and failed to take the temperature on site during the visit. These practices may influence significantly the HOT2000 simulation and, therefore, the calculated EnerGuide rating.
- > **Promote the addition of typical technical details on audit reports:** Typical energy reports that are automatically generated by HOT2000 contain a low level of technical details on the proposed energy efficiency measures and on how to implement them. In addition, some concerns may be important to mention in energy reports, such as the installation of an air exchanger in an old house whose air infiltrations would decrease significantly with the improvement of the building envelope. With this in mind, Econoler believes that ENSC should promote the addition of technical information and safety concerns (if any) on the audit reports to help participants understand and follow up on their energy efficiency project.
- > **Encourage the energy advisor to provide participants with booklets:** Under its ecoENERGY program, NRCan developed a series of booklets for home owners. The booklets aim at explaining energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide “Keeping the Heat In”). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants agreeing with the recommendations of the audit report.

### **3.7 PERCEPTIONS RELATED TO PROGRAM CHANGES**

Two DAs and two energy auditors (EAs) were interviewed under the process evaluation. The program partners were asked about the recent changes in the EEH program and their impact.

According to the DAs interviewed, the exit of the Federal Government created some confusion in the market and led to uncertainty over the existence of the program. Most Nova Scotians simply assumed that the program had been terminated with the Federal Government announcement in March 2010. Moreover, many auditors sought other employment when NRCan ended the program, thus leaving fewer available resources for the program continuation. Indeed, one DA indicated that he could use the service of another auditor or two at this time.

The reinstatement of the federal program in 2011 significantly increased the complexity of the participation process. Participants received conflicting messages from the Federal Government and ENSC, creating confusion and causing substantial fluctuations in program demand and interest. However, the fact that ENSC acts as a single window for taxpayers and rate payers simplifies program implementation and participation.

The program name change from “EnerGuide for Existing Houses” to “EnerGuide for Existing Houses and Multi-Unit Residential Buildings” is considered a positive change since MURB owners are now clearly targeted by the program, can achieve savings and obtain rebates for their rental properties.

### **3.8 RELATIONSHIP WITH PROGRAM PARTNERS**

The program partners interviewed are satisfied with the EEH program in general and all of them have a very high level of satisfaction with their relationship with ENSC’s team. However, it was found that satisfaction with other elements of the program is lower.

The DAs are satisfied with their relationship with other program partners involved. On the other hand, the EAs seem to be less satisfied with their relationship with other program partners claiming that there is very little interaction between the service organizations (DAs and contractors) and that some contractors continue to show a lack of understanding of EE programs, which can lead to confusion among homeowners.

While one energy auditor expressed a high level of satisfaction with the training activities delivered by NRCan, another expressed dissatisfaction, explaining that there is no support after receiving the training. Following the training, support on HOT2000 could be offered in association with NRCan, particularly in regard to the software’s regular updates.

The marketing and outreach activities are rather negatively perceived by the program partners. According to them, the program needs consistent marketing and promotion regardless of the involvement of the Federal Government. Besides the Team Buy initiatives<sup>6</sup>, which appear to have been a success, there has been little marketing effort at the provincial level. Further marketing initiatives will be required in order to be proactive in educating Nova Scotians about the fact that ENSC and the Province are committed to the program regardless of federal support. Furthermore, with the Federal Government withdrawing from the program, the program partners believe that ENSC and the Province should increase funding to compensate for the loss of federal funds and add new rebates for additional insulation and air sealing.

The most important barrier identified by the program partners is the uncertainty regarding the program continuation in the near future and the availability of funds. As for barriers that non-participants face, the program partners mentioned time constraints as well as lack of program awareness.

According to the EAs, complaints received by some participants are related to an insufficient level of incentives or lack of information on qualifying measures. EAs also mentioned participants' confusion regarding rebate levels and how they are paid.

To improve the program, one EA suggests refining the HOT2000 software, which still has bugs, for the next generation of energy programs. One EA also suggests that incentives should reflect the energy savings for particular upgrades. For instance, insulating an uninsulated basement has a much greater reduction in energy use than adding R3.8 to an R-8 wall, yet the incentive for the wall upgrade is almost double that of the basement. Finally, one EA would like to see higher incentives to drive interest in the program.

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<sup>6</sup> ENSC's Team Buy initiatives were a marketing campaign based on the website of the same name where customers can save money by uniting to buy the same product. ENSC's Team Buy initiatives offered energy audits for a price of \$39. Direct installation of low cost measures was also included in the Team Buy offer.  
For more information on the Team Buy approach, visit the following website: <http://www.teambuy.ca/>.

## 3.9 PARTICIPANT PERSPECTIVES

### 3.9.1 Program Awareness

Four in 10 participants learned about the EEH program by word of mouth (40%), while just over two in 10 learned about the program in the newspaper (23%). One in 10 learned about the program on the Internet (10%), television (10%), radio (10%) or a home show (9%), while less than one in 10 heard about the program from a contractor (7%). If word of mouth is the main source of awareness for the program, marketing activities also contribute to its awareness.

**Table 7: How Customers Learned About the Program**

| <b>Program Awareness</b>         | <b>2009*</b> | <b>2010</b> | <b>2011*</b> |
|----------------------------------|--------------|-------------|--------------|
| <i>Sample Size</i>               | 23           | 70          | 70           |
| Word of mouth                    | 48%          | 40%         | 40%          |
| Newspaper ad or story            | 17%          | 14%         | 23%          |
| The Internet                     | 13%          | 10%         | 10%          |
| Television                       | 9%           | 8%          | 10%          |
| Radio                            | 9%           | 6%          | 10%          |
| Home show                        | 9%           | 8%          | 9%           |
| From a contractor                | --           | --          | 7%           |
| Building supply dealer/store     | --           | 3%          | 4%           |
| Nova Scotia Power bill insert    | --           | 1%          | 3%           |
| Work with energy-related company | 4%           | 4%          | --           |
| Brochure                         | 9%           | 3%          | --           |
| Geothermal company               | 4%           | 3%          | --           |
| Bank                             | --           | 1%          | --           |
| Delivery Agent—SHEC              | 9%           | --          | --           |
| Literature from exhibition       | --           | --          | --           |
| Community centre                 | --           | --          | --           |
| Other                            | --           | --          | 13%          |
| Don't know                       | --           | --          | 7%           |
| *Multiple responses              |              |             |              |

### 3.9.2 Participation Motivations and Barriers

Similar to last year, the primary reason for participants taking part in the EEH program is to save money on energy costs and bills (33%), followed by an interest in finding out how efficient their home is (17%). Over one in 10 participants took part in the program primarily because they wanted an expert opinion on how to make their home more efficient (14%) or to get rebates in general (14%). One in 10 were already thinking about implementing energy efficiency measures (9%) while under one in 10 wanted to help the environment (6%). Secondary motivators are generally consistent with primary motivators.

**Table 8: Reasons for Interest in Having Home Evaluated**

| Participant Motivations                                        | 2009           |                    | 2010           |                     | 2011           |                     |
|----------------------------------------------------------------|----------------|--------------------|----------------|---------------------|----------------|---------------------|
|                                                                | Primary Reason | Secondary Reasons* | Primary Reason | Secondary Reasons * | Primary Reason | Secondary Reasons * |
| <i>Sample Size</i>                                             | 23             | 23                 | 70             | 70                  | 70             | 70                  |
| To save on energy costs/bills                                  | 17%            | 17%                | 26%            | 16%                 | 33%            | 17%                 |
| Find out how efficient my home was/evaluation                  | 9              | 17                 | 20             | 14                  | 17             | 6                   |
| To get an expert opinion on how to make my home more efficient | 4              | 13                 | 9              | 6                   | 14             | 16                  |
| Rebates                                                        | 13             | 26                 | 11             | 10                  | 14             | 9                   |
| Already thinking about implementing energy efficiency measures | 39             | 13                 | 24             | 10                  | 9              | 13                  |
| To help the environment                                        | --             | 13                 | 4              | 3                   | 6              | 3                   |
| To save energy                                                 | 17             | 22                 | 6              | 8                   | 3              | --                  |
| To improve heating                                             | --             | --                 | --             | --                  | 1              | 6                   |
| Blower door test                                               | --             | 4                  | --             | 1                   | --             | --                  |
| Other                                                          | --             | --                 | --             | --                  | 3              | 7                   |
| No other reasons                                               | N/A            | 13                 | N/A            | 30                  | --             | 4                   |
| Don't know                                                     | --             | --                 | --             | --                  | --             | 29                  |
| Refused                                                        | --             | --                 | --             | --                  | --             | 1                   |
| *Multiple responses                                            |                |                    |                |                     |                |                     |

Six percent of participants had concerns about the EEH program prior to taking part, which is consistent with past findings. From the four respondents who had concerns, two felt the rebates would be too low, two thought the improvements would be too expensive and one thought the process would take too long (one participant offered more than one response to this question).

**Table 9: Concerns Prior to Program Participation**

| <b>Participant Concerns</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>          | 23          | 70          | 70          |
| Yes                         | 9%          | 7%          | 6%          |
| No                          | 91          | 93          | 94          |

### 3.9.3 Program Influence

Respondents were asked to rate the importance of the program elements that might have influenced their decision to implement energy-efficient measures through the program. The information or advice from the energy auditor was deemed most important (mean of 8.5), followed by program incentives (mean of 8.4) and information or advice provided through the program (mean of 8.3). The EnerGuide label and designation were less important (mean of 6.8), while previous experience was not deemed important (mean of 4.6).

**Table 10: Importance of Program in Influencing Decisions**

| <b>Mean Rating:<br/>10= "extremely important" and 0= "not important at all"</b>                     | <b>2011</b> |
|-----------------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                                  | 70          |
| Information or advice from the energy auditor                                                       | 8.5         |
| Program incentives                                                                                  | 8.4         |
| Information or advice provided through the program                                                  | 8.3         |
| EnerGuide label and designation themselves                                                          | 6.8         |
| Previous experience with the EEH program or a similar program from either ENSC or Nova Scotia Power | 4.6         |

### 3.9.4 Recommendations and Implementation through the Program

Overall, six respondents indicated that they were not given recommendations for any of the items listed as potential measures. From the remaining 64 respondents, 42 percent implemented at least one of the measures recommended and 50 percent implemented all of the measures recommended (keeping in mind that some of these respondents might have only been given recommendations for one measure). Finally, six percent of respondents did not implement any of the measures recommended.

**Table 11: Implemented Energy Efficiency Measures Recommended**

| <b>Implemented Energy Efficiency Measures Recommended</b> | <b>2011</b> |
|-----------------------------------------------------------|-------------|
| <i>Sample Size</i>                                        | 64          |
| Implemented all measures recommended                      | 50%         |
| Implemented some of the measures recommended              | 42          |
| Did not implement any measures recommended                | 6           |
| Don't know                                                | 2           |



Similar to 2010 results, the most recommended measure was electronic programmable thermostats (63%) and 51 percent of participants implemented an electronic programmable thermostat. Just under six in 10 were recommended exposed pipe insulation for an electric water heater (56%) and 51 percent implemented this measure. A similar percentage of participants were recommended electric water heater tank insulation and 44 percent implemented this measure. Among the measures recommended, the following are those with the lowest implementation rate: high-efficiency air to air heat pumps with electric backup, high-efficiency ground source heat pumps and drain water heat recovery units.

**Table 12: Recommended and Implemented Measures**

|                                                                | 2009        |             | 2010        |             | 2011        |             |
|----------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                                                | Recommended | Implemented | Recommended | Implemented | Recommended | Implemented |
| <i>Sample Size</i>                                             | 23          | 23          | 70          | 70          | 70          | 70          |
| Electronic programmable thermostats                            | 70%         | 43%         | 66%         | 41%         | 63%         | 51%         |
| Electric water heater exposed pipe insulation                  | N/A         | N/A         | 36          | 10          | 56          | 51          |
| Electric water heater tank insulation                          | N/A         | N/A         | 43          | 7           | 51          | 44          |
| High-efficiency air to air heat pumps with electric backup     | 22          | 13          | 20          | 9           | 30          | 7           |
| Solar domestic water heating systems                           | 30          | 13          | 26          | 11          | 24          | 11          |
| Electric thermal storage room units                            | 22          | --          | 23          | 11          | 19          | 9           |
| High-efficiency ductless mini-split heat pumps                 | N/A         | N/A         | 13          | 4           | 17          | 7           |
| High-efficiency ground source heat pumps                       | 30          | 22          | 16          | 4           | 17          | 3           |
| Drain water heat recovery                                      | 13          | --          | 13          | 1           | 11          | 1           |
| High-efficiency air to air heat pumps with non-electric backup | 13          | --          | 10          | 7           | 4           | 1           |
| Electric thermal storage hot air furnaces                      | 13          | --          | 6           | --          | 6           | --          |
| Electric thermal storage central hydronic systems              | 4           | 4           | 4           | 3           | 1           | --          |

The next table shows the measure uptake (installations as a percentage of recommendations) of each proposed energy efficiency measure. Analysis of these indicators revealed that among the measures that have been recommended to participants and implemented through the EEH program, electric water heater exposed pipe insulation and tank insulation, along with electronic programmable thermostats are those that had the highest uptake among program participants.

**Table 13: Effectiveness of Measures**

| <b>Proposed Energy Efficiency Measures</b>                     | <b>Measure Uptake</b> |
|----------------------------------------------------------------|-----------------------|
| <i>Sample Size</i>                                             | <i>70</i>             |
| Electric water heater exposed pipe insulation                  | 91%                   |
| Electric water heater tank insulation                          | 86%                   |
| Electronic programmable thermostats                            | 81%                   |
| Electric thermal storage room units                            | 47%                   |
| Solar domestic water heating systems                           | 46%                   |
| High-efficiency ductless mini-split heat pumps                 | 41%                   |
| High-efficiency air to air heat pumps with non-electric backup | 25%                   |
| High-efficiency air to air heat pumps with electric backup     | 23%                   |
| High-efficiency ground source heat pumps                       | 18%                   |
| Drain water heat recovery                                      | 9%                    |
| Electric thermal storage hot air furnaces                      | -                     |
| Electric thermal storage central hydronic systems              | -                     |

Among respondents who did not implement at least one of the recommended measures, six in 10 believed that the recommended measure was too expensive (61%), which was the top reason in 2010 and 2009 as well. A small number did not have the financial means to implement the measure (6%), they were too busy (6%), they did not believe they needed it (3%) or the rebate was not big enough (3%).

Since the main reason cited by participants for not having implemented some measures recommended by the EEH program is that measures are too expensive, the Evaluator suggests informing the participants about the expected savings of their projects based on the duration of the measure. This could be included in the pre-retrofit report with a view to reducing the perceived cost barrier.

**Table 14: Reasons all Recommended Measures were not Implemented**

|                                                                       | 2009           |                    | 2010           |                    | 2011           |                     |
|-----------------------------------------------------------------------|----------------|--------------------|----------------|--------------------|----------------|---------------------|
|                                                                       | Primary Reason | Secondary Reasons* | Primary Reason | Secondary Reasons* | Primary Reason | Secondary Reasons * |
| <i>Sample Size</i>                                                    | 15             | 15                 | 50             | 41                 | 31             | 30                  |
| Too expensive                                                         | 33%            | 7%                 | 46%            | 17%                | 61%            | 7%                  |
| Didn't have the financial means                                       | 13             | --                 | --             | 2                  | 6              | 7                   |
| Too busy                                                              | 7              | --                 | 4              | --                 | 6              | --                  |
| Didn't think they really needed it                                    | 7              | 7                  | 12             | 4                  | 3              | 7                   |
| Rebate not big enough                                                 | 7              | 7                  | --             | --                 | 3              | 3                   |
| Planned to implement in the future                                    | --             | 20                 | 2              | 6                  | --             | 7                   |
| Payback too long                                                      | --             | --                 | --             | --                 | --             | 7                   |
| Didn't replace things that were still working                         | 7              | --                 | 6              | --                 | --             | --                  |
| Needed to do more research on recommended measures                    | 13             | --                 | 4              | --                 | --             | --                  |
| Wanted to implement measures that weren't covered through the program | 7              | --                 | 2              | 3                  | --             | --                  |
| Insulation is not environmentally friendly                            | 7              | --                 | 2              | --                 | --             | --                  |
| Had another heat source                                               | --             | 7                  | --             | --                 | --             | --                  |
| Looking for alternatives                                              | --             | 7                  | --             | --                 | --             | --                  |
| Other                                                                 | --             | --                 | --             | --                 | 16             | 3                   |
| No other reasons                                                      | --             | 47                 | --             | 63                 | --             | --                  |
| Don't know                                                            | --             | --                 | 22             | --                 | 3              | 53                  |
| Refused                                                               | --             | --                 | --             | --                 | --             | 7                   |
| *Multiple responses                                                   |                |                    |                |                    |                |                     |

### 3.9.5 Program Impacts

Nine in 10 (90%) respondents have noticed a change in their comfort level since the energy efficiency measures have been implemented through the program. This is consistent with findings from previous years. When asked specifically about the changes, one-third reported that their house is warmer (32%) and approximately three in 10 reported even temperatures throughout their home (29%) or that there are fewer drafts throughout the home (27%). Other mentions included reduced cost of energy (16%), it is more convenient to control temperatures automatically (10%) and more comfortable temperatures in the home (10%).

**Table 15: Specific Impacts on Comfort**

| <b>Noticed Change in Comfort Level</b>                | <b>2009</b>  | <b>2010</b>  | <b>2011</b>  |
|-------------------------------------------------------|--------------|--------------|--------------|
| <i>Sample Size</i>                                    | 22           | 65           | 70           |
| Yes                                                   | 86%          | 89%          | 90%          |
| No                                                    | 9            | 8            | 9            |
| Don't know                                            | --           | 3            | 1            |
| Refused                                               | 5            | --           | --           |
| <b>Changes Noticed</b>                                | <b>2009*</b> | <b>2010*</b> | <b>2011*</b> |
| <i>Sample Size</i>                                    | 19           | 59           | 63           |
| House is warmer                                       | --           | --           | 32%          |
| Even temperatures throughout the home                 | 79%          | 71%          | 29           |
| Fewer drafts throughout the home                      | 47           | 29           | 27           |
| Reduced cost of energy                                | --           | --           | 16           |
| More convenient to control temperatures automatically | 21           | 15           | 10           |
| More comfortable temperature throughout home          | --           | --           | 10           |
| House is less humid                                   | --           | --           | 8            |
| House is cooler in summer                             | --           | --           | 6            |
| Easier to heat                                        | --           | --           | 5            |
| Affordable heat/warmer                                | 21           | 12           | --           |
| Air is fresher                                        | --           | 9            | --           |
| Hot water lasts longer                                | --           | 3            | --           |
| Don't have to put wood in stove                       | 5            | 2            | --           |
| Heat is not as comfortable/basement is colder         | 5            | 2            | --           |
| Other                                                 | --           | 7            | 10           |
| Don't know                                            | --           | 2            | 2            |
| *Multiple responses                                   |              |              |              |

Just under six in 10 respondents reported that their energy bill has gone down (57%) as a result of the energy efficiency measures, which is consistent with findings from 2010. Seven percent reported that their bill has gone up while one-third reported no change in their energy bill or that it has not been long enough to know (32%).

**Table 16: Changes Noticed in Energy Bills Since Implementation**

| <b>Effect on Energy Bill</b>    | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>              | 23          | 70          | 70          |
| Bills have gone down            | 65%         | 57%         | 57%         |
| Bills have gone up              | 9           | 4           | 7           |
| No change in the bills          | 4           | 7           | 23          |
| Hasn't been long enough to know | 17          | 27          | 9           |
| Don't know                      | 4           | 4           | 4           |

### 3.9.6 Satisfaction with the Program

The majority of respondents were satisfied with the program overall (90%), which is consistent with past findings.

**Table 17: Overall Satisfaction with the Program**

| <b>Satisfaction with the Program</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                   | 23          | 70          | 70          |
| Very satisfied                       | 70%         | 75%         | 61%         |
| Satisfied                            | 26          | 20          | 29          |
| Neither satisfied nor dissatisfied   | --          | 3           | 6           |
| Dissatisfied                         | 4           | 2           | 3           |
| Very dissatisfied                    | --          | --          | 1           |

Those who were dissatisfied or very dissatisfied (n=4), expressed this opinion for the following reasons: they had not received their rebate yet, there was a lack of information or the equipment they had installed was not eligible.

Respondents were asked about their satisfaction with specific aspects of the program. The results show an extremely high level of satisfaction. Nearly all respondents were satisfied with the first energy audit overall (99%), the courtesy of the energy advisor (99%) and the scheduling and timing of the first audit (99%). Similarly, there is a high level of satisfaction with the information provided by the energy advisor (97%), the report received about the homes' current energy use and recommendations (96%), the scheduling and timing of the final audit (96%) as well as the final energy audit overall (94%). The rebates provided by the program in general received somewhat lower satisfaction ratings in comparison with other measures, although this rating is still high (86%).

**Table 18: Satisfaction with Specific Aspects of the Program\***

| <b>Satisfaction with Specific Aspects of the Program</b>            | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------------------------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                                  | 23          | 70          | 70          |
| First energy audit overall                                          | 100%        | 99%         | 99%         |
| Courtesy of energy advisor                                          | 100         | 100         | 99          |
| Scheduling and timing of the first audit                            | 86          | 93          | 99          |
| Information provided by energy advisor                              | 100         | 99          | 97          |
| Report received about homes' current energy use and recommendations | 100         | 96          | 96          |
| Scheduling and timing of the final audit                            | 96          | 96          | 96          |
| Final energy audit overall                                          | 87          | 93          | 94          |
| Rebates provided by the program overall                             | --          | --          | 86          |
| *(% very satisfied/satisfied)                                       |             |             |             |

Respondents who were dissatisfied with the first or final energy audit were asked specifically about their dissatisfaction. Two respondents found the energy evaluator to be unpleasant, one felt the energy audit took too long, one did not agree with the recommendations made, one was dissatisfied with the follow-up report and another mentioned a general lack of information.

Similar to previous results, nearly all respondents are satisfied with the energy efficiency measures implemented in their home (96%).

**Table 19: Satisfaction with Energy Efficiency Measures**

| <b>Satisfaction with Energy Efficiency Measures</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                  | 22          | 65          | 70          |
| Very satisfied/satisfied                            | 100%        | 97%         | 96%         |

### 3.9.7 Recommendations for Improvement

Just over four in 10 respondents (43%) feel that some energy efficiency measures that were not covered by the program should have been. Specific mentions of measures included heating, insulation, windows, solar panels and appliances.

**Table 20: Suggested Additional Measures**

| <b>Suggested Additional Measures</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                   | 23          | 70          | 70          |
| Yes                                  | 35%         | 41%         | 43%         |
| No                                   | 57          | 46          | 54          |
| Don't know                           | 9           | 0           | 3           |

Fifty percent of respondents were unable to offer any recommendations for improving the EEH program. Among respondents who suggested program improvements, 14 percent mentioned offering more information on the measures recommended and 9 percent mentioned increasing the period given to complete the implementation. A small number of participants also suggested increasing the rebates (7%), offering more measures eligible for rebates (6%), improving communication (3%), completing the first or final audit sooner (3%) or advertising the program in a better way (1%).

With respect to respondents who suggested offering more information on the measures recommended, some mentioned that eligible measures versus the measures not covered by the program could be clearer, as explained by this respondent: "When they come to do the audit, and we discuss the recommendations, they should be very certain as to what will be qualified. I installed high efficiency heat system that did not qualify because of the coil type." Another respondent explained that he did not understand well some of the wording used through the audit and that he ended up not qualified for the rebate. His suggestion would be to have someone going over the audit verbally.

The program partners contacted during the in-depth interviews mentioned having received complaints from participants about the lack of information on qualifying measures. This reinforces the recommendation to provide the participants with more information on the measures recommended.

**Table 21: Suggested Program Improvements**

| <b>Suggested Program Improvements</b>                    | <b>2011</b> |
|----------------------------------------------------------|-------------|
| <i>Sample Size</i>                                       | <i>70</i>   |
| Offer more information on the measures recommended       | 14%         |
| Increase the period given to complete the implementation | 9           |
| Increase rebates/give bigger rebates                     | 7           |
| Offer more measures eligible for rebates                 | 6           |
| Improve communication                                    | 3           |
| Complete the first or final audit sooner                 | 3           |
| Advertise the program more or in a better way            | 1           |
| No recommendation                                        | 50          |
| Other                                                    | 11          |

Seven in 10 respondents believe that a diagram illustrating the steps of the EEH program would have facilitated their participation in the program (70%). This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 22: Provision of a Diagram Illustrating Steps of EnerGuide for Existing Houses Program**

| <b>Diagram Illustrating Steps of EnerGuide for Existing Houses would have Facilitated Participation</b> | <b>2011</b> |
|---------------------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                                      | <i>70</i>   |
| Significantly                                                                                           | 30%         |
| Somewhat                                                                                                | 40          |
| Slightly                                                                                                | 9           |
| Not at all                                                                                              | 19          |
| Don't know                                                                                              | 3           |



## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, Econoler analyzed the following parameters:

- > HOT2000 simulations;
- > prescriptive measure savings;
- > free-ridership; and
- > internal spillover.

The impact evaluation was essentially based on a comparative analysis of the program tracking sheet and the results of 25 sampled building simulations. Econoler also fine-tuned its evaluation using outcomes from the participant survey.

More specifically, the review of the program tracking sheet included an analysis of energy savings for each prescriptive measure and an assessment of how the savings were calculated. The on-site visits were used to verify audit procedures. The analysis of 25 building simulations and their respective electricity billing was used to calibrate the simulation results and estimate gross energy savings more realistically.

The participant surveys provided information to calculate the net-to-gross ratio (NTGR) for this program, including free-ridership and internal spillover. The NTGR established was used to calculate program net savings.

Last year's verification study recommended that the program impact evaluation led with a billing analysis move to a "non-equivalent control group" design. Unfortunately, this approach was not used this year because of time constraints relating to NRCAN's approval of the release of participant results. Indeed, a non-participant survey would have been required in order to select a comparison group comprising very similar non-participant houses. In addition, there is a problem with using almost any participant and non-participant group combined, which would lead to a selectivity bias (such a problem may be aggravated through a billing analysis). When comparing them or regressing them together, the resulting estimate is between gross savings and net and it is difficult to tell how much each of these affect the difference between the groups. There are also circumstances where the results are biased depending on the distribution of motivations and changes between the groups. This problem is discussed in the 2004 California Evaluation Framework<sup>7</sup>.

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<sup>7</sup> California Evaluation Framework, TecMarket Works, June 2004, pp.142-143.

A better way to use the comparison group could be to look for trends or to construct a trend line that can be incorporated into the analysis. For the billing analysis, the trend line could be in the participant regression rather than using a non-participant group. The regression could also use economic indicators and test their correlation with any trend lines in the comparison group. This approach could be discussed with ENSC for next year's evaluation.

## **4.2 GROSS SAVINGS**

Econoler estimated program gross savings through the comparative analysis of information available in the program tracking sheet and 25 sampled project simulations, as well as through a review and proper adjustment of prescriptive measure savings.

The program tracking sheet provided by ENSC for 2011 contained a total of 1,494 projects. From these projects, only 1,489 included the information necessary for savings calculations. The other projects missed essential information for savings calculations, namely the primary space heating energy and the percentage of electrical space heating. Consequently, the savings per EnerGuide point of these five projects were not taken into account in the gross savings estimate. Indeed, the Evaluator only included the savings for each prescriptive measure implemented.

The incremental energy savings per EnerGuide point (hereafter referred to as "savings per EnerGuide point") along with the savings from prescriptive measures are necessary to calculate program gross savings. The methodology for evaluating these elements is described in the following sections.

### **4.2.1 Savings per EnerGuide Point**

In 2011, ENSC calculated a portion of the program's energy savings using an incremental savings coefficient per increase of EnerGuide point (also referred to as "savings per EnerGuide point"). In ENSC's methodology, the difference between pre-audit (D) and post-audit (E) simulation ratings was used for calculating the increase of EnerGuide point. For this calculation, ENSC used an energy savings of 1,047 kWh per EnerGuide point. The 1,047 kWh savings figure came from the 2010 EEH program evaluation report. In addition, the savings per EnerGuide point were calculated by ENSC as a function of the percentage of the space heating load delivered by electricity (ranging from 0 to 100%).

The next sections describe the methodology followed by Econoler to define the energy savings per EnerGuide point. This factor is applied to each project considered under the EEH program.

## **Sampling Methodology**

Econoler selected a sample of 25 projects to estimate savings per EnerGuide point and calibrate these savings with the billing information.

The sample was established from the participant list found in the tracking sheet, which included 1,301 projects as of August 2011. Projects were sorted to consider only those which contained all required information as well as to cover a wide variety of prescriptive measures. More particularly, Econoler applied the following criteria to sample projects to be used for calculating the amount of savings per EnerGuide point:

- > A number of projects were missing at least one of the three essential categories of data (initial and final EnerGuide ratings, and percentage of electric space heating). The EnerGuide rating of other projects also decreased or remained unchanged after project implementation. In these two specific cases, Econoler automatically removed the projects from sampling.
- > When using HOT2000 for analysis of electrical energy savings, buildings must be at least partially electrically heated to obtain a reduction in electricity consumption. All projects that did not involve electric space heating were therefore removed from the sampling population.
- > Projects with outlier values on both initial (i.e.,  $\leq 10$  or  $\geq 90$ ) or final (i.e.,  $\leq 30$  or  $\geq 90$ ) EnerGuide ratings were also excluded from sampling. The EnerGuide ratings out of these ranges were considered unreliable. In total, less than 1 percent of projects had such EnerGuide ratings. Although removed from sampling, it is worth noting that these projects were taken into account in the final savings calculation.
- > Since billing information from NSPI had to be used for calibration purposes, Econoler also removed all projects that had an invalid utility account number or for which the account number was not available.
- > At least one project from each of the six energy advisor companies was included in sampling.
- > The final sample also includes at least one project for each of the six prescriptive measures that have been analyzed through program impact evaluation, namely:
  - drain water heat recovery with an efficiency between 30 and 42 percent;<sup>8</sup>
  - drain water heat recovery with an efficiency of 42 percent or greater;
  - solar domestic hot water heating system (solar DHW);
  - electric hot water heater tank wrap; and
  - electric hot water heater pipe insulation and programmable thermostats.

Econoler used the above list of sampling criteria with the aim of having a representative sample of projects. After having filtered the program population, Econoler randomly selected 25 projects from this sampling population in order to minimize potential discrepancies between the sample and the total program population.

Upon finalization of the sampling process, Econoler compared the sample and project population using the following three indicators: average initial EnerGuide ratings, average final EnerGuide ratings

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<sup>8</sup> In fact, only two projects involved one of the two drain water heat recovery measures (i.e. with efficiency of 30% to 41.9% or 42% and more). These two projects were therefore automatically chosen when performing the sampling.

and average energy savings per project (in kWh/year). The results of this comparison analysis are presented in the next table.

**Table 23: Sampled Projects Compared to Population**

| Description         | Average Initial EnerGuide Rating | Average Final EnerGuide Rating | Average Energy Savings per Project in the Tracking Sheet (kWh/year) |
|---------------------|----------------------------------|--------------------------------|---------------------------------------------------------------------|
| Sampling Population | 69.0                             | 74.5                           | 5,352                                                               |
| Sample              | 71.1                             | 75.8                           | 4,233                                                               |

For reference purposes, the average initial and final EnerGuide ratings of the overall program population (1,494 projects) are respectively 68.2 and 73.7. When comparing these values with those of the above table, Econoler also considers that the 25-project sample is also very likely to be representative of the initial program population.

## EnerGuide Rating

The sampled projects were used to analyze the average energy savings per EnerGuide point through the comparison of pre-audit (D) and post-audit (E) simulation results.

Econoler extracted the EnerGuide points and the annual electrical energy consumption data from the HOT2000 simulations received. When analyzing the data, Econoler found out that the HOT2000 files were not available for one of the sample projects. For another project, simulation outcomes were not in line with program logic. For this particular case, the energy consumption increased after the renovation, which is not supposed to occur (this may have been due to an entry error the auditor made when performing the building simulation). Considering these two particular situations, Econoler decided to conduct its savings per EnerGuide point analysis taking into account only 23 out of the 25 sample projects.

For each project, Econoler then calculated the electricity savings between audits D and E as well as the difference between the EnerGuide ratings (after and before project implementation). To avoid giving more weight to any of the projects, Econoler calculated the average savings per EnerGuide point of each project before summing all values. At the end, Econoler computed the overall average of each project unitary savings value per EnerGuide point.

The next table shows a summary of key values used for the calculation of the overall average savings per EnerGuide point of the sample.

**Table 24: Calculation of Average Savings per EnerGuide Average Point Saving from HOT2000 Data**

| Description                                                                 | Values and Units            |
|-----------------------------------------------------------------------------|-----------------------------|
| Number of projects                                                          | 23                          |
| Increase of EnerGuide point per project <sup>9</sup>                        | From 1 to 25                |
| Energy savings per project                                                  | From 413 to 29,372 kWh/year |
| Average savings per EnerGuide point, per project                            | From 413 to 1,479 kWh/year  |
| <b>Overall average savings per EnerGuide point, for all sample projects</b> | <b>1,089 kWh/year</b>       |

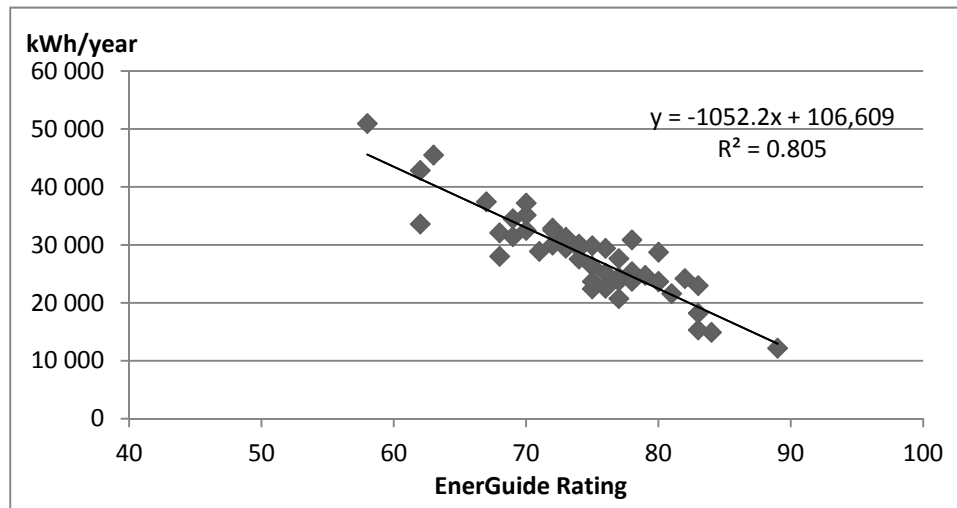
As per the above table, Econoler estimated the overall value of savings per EnerGuide point at 1,089 kWh/year, using data from all sample projects. Upon completion of this simulation analysis, Econoler highlights the following findings:

- > The calculated energy savings values per EnerGuide point are significantly variable. In fact, they range from 413 kWh to 1,479 kWh of savings per EnerGuide point and have an average standard deviation of 161 kWh. This consideration may decrease the accuracy of the overall average value found.
- > For each project, the calculated savings per EnerGuide point does not seem to be influenced by any of the evaluated parameters. For instance, the average savings value per EnerGuide point does not change significantly whether the project involves a higher or lower increase of the EnerGuide rating.
- > When validating the HOT2000 simulations, Econoler found that initial EnerGuide ratings included in the tracking sheet and HOT2000 simulations were occasionally different. Such discrepancies happened six times and the level of difference in initial EnerGuide ratings was one or two points. Furthermore, these errors happened only for D audit simulations. To be consistent, Econoler thus decided to always use HOT2000 simulation data to perform the savings per EnerGuide point analysis.

For the sake of improving the precision of the previous analysis, Econoler conducted a linear regression analysis, based on the initial and final building energy consumption of all sample projects as a function of the respective EnerGuide rating of each project. The next figure features the results of this regression analysis along with the calculated linear equation for estimating the simulated energy consumption of a residential building in relation with its EnerGuide rating.

<sup>9</sup> 22 out of the 23 sample projects show an increase of their EnerGuide point between 1 and 8. The energy savings per project of these 22 projects range from 413 to 10,350 kWh/year.

**Figure 3: Linear Regression Analysis on Building Electricity Consumption Based on EnerGuide Rating**



This linear regression was established using 47 points. The coefficient of determination  $R^2$  (0.805) shows that this regression is statistically acceptable (over 0.75) and thereby likely representative of the population. In addition, the absolute t-statistic of the slope of the curve is 13.6, which shows that the estimated coefficient (1,052.2) is relevant and that there is a significant relationship between the energy consumption (y) and the EnerGuide rating of the house (x). A rule of thumb states that the absolute value of the t-statistic should be 2 or higher to show a significant relationship between y and x.<sup>10</sup>

Through this regression analysis, the Evaluator found a regression coefficient (1,052 kWh) almost equal to the previously calculated EnerGuide savings per point (1,089 kWh). However, the Evaluator wants to put into perspective the following considerations with regard to this regression analysis:

- > The linear equation is considered representative for the range of data used for performing the regression analysis; i.e., for EnerGuide ratings ranging from 58 to 89.
- > Out of this range, the linear equation can be considered good for estimating energy consumption values with a more significant uncertainty level. It is worth noting that respectively 83 and 93 percent of initial and final EnerGuide rating values of the overall population are located inside the range of 58 to 89.
- > The Evaluator used 47 points in its regression analysis, which comes from the simulations of the 25 sample projects. The fact that each project is considered twice (before and after project implementation) may improve the overall coefficient of determination  $R^2$ .

<sup>10</sup> International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Volume 1, EVO 10000 – 1:2012, January 2012, p. 96-97 (Appendix B).

- > Three energy consumption data were removed prior to performing the regression analysis. For two of them, the energy consumption value per EnerGuide rating was either missing or assumed unreliable. The third energy consumption value<sup>11</sup> was considerably out of range and thus tended to distort the linear regression curves and equation. The Evaluator consequently decided to remove it from the regression analysis.

Even though the statistical parameter  $R^2$  confirms that the linear regression coefficient can be considered acceptable, the Evaluator decided to use the average savings value (1,089 kWh per EnerGuide point) calculated from the first simulation analysis for further energy savings calculations.

### **Calibration of Simulation Results**

A billing review was conducted to evaluate the accuracy of the results obtained from the HOT2000 simulations. To do so, Econoler compared these results to the real energy consumption of residential buildings, as per NSPI billing data. This billing review was made using D audit simulation results and NSPI billing data of houses before project implementation. The billing data used for this simulation was for a 12-month period between summer 2009 and summer 2010.

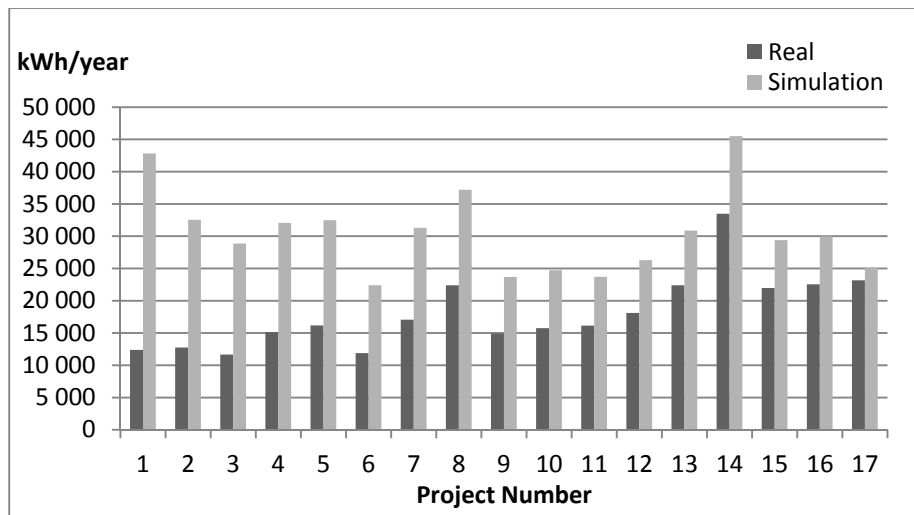
Econoler received the billing data for all 23 projects used for calculating the average savings value per EnerGuide point as well as for conducting the linear regression analysis. One full year of billing data was selected before the participation date and used for comparison. When analyzing the data received, Econoler found that six out of the 23 sets of data were considered unreliable. In fact, five of these projects had a very small energy consumption compared to typical values expected for a home in Nova Scotia. For the other project, the format of the billing data was not standard, which made the data unusable. These six series of billing energy consumption data were therefore discarded before the simulation calibration analysis.

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<sup>11</sup> More precisely, this energy consumption value was 80,298 kWh/year for an EnerGuide rating of 33. This value was far from the population average and thus has over-influenced the regression analysis (it increased the  $R^2$  of the regressions analysis by 10%). Consequently, Econoler decided not to include this value in the regression analysis.

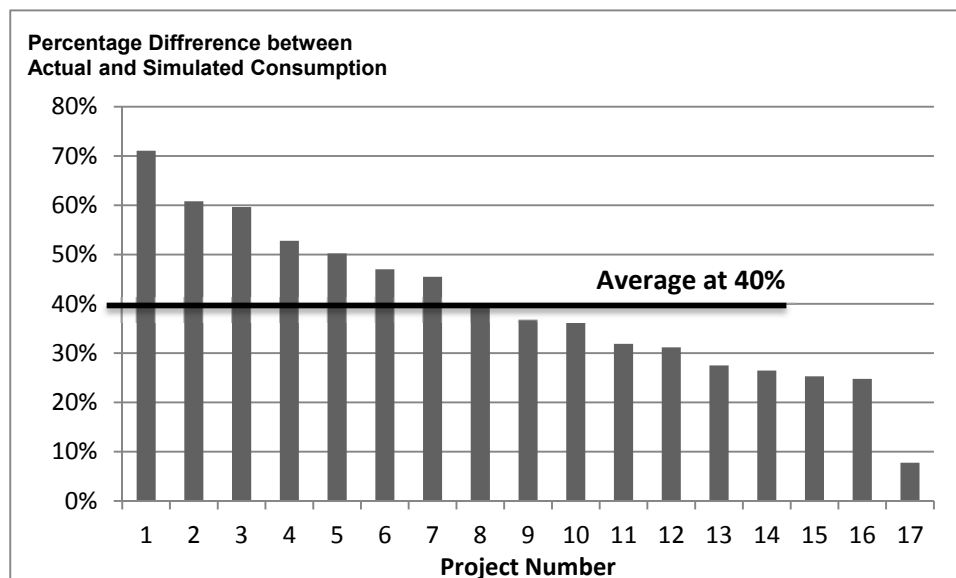
The following figure compares the annual electricity consumption from NSPI billing and from HOT2000 simulations.

**Figure 4: Comparison of Simulated and Real Consumption of Sample Residential Buildings**



At first glance, the above figure clearly demonstrates that HOT2000 tends to overestimate building energy consumption. With the aim of quantifying this overestimation of energy consumption (and thereby making adjustments to energy savings calculations), the next figure spreads the 17 sample projects in terms of percentage difference between actual and simulated consumption.

**Figure 5: Spread of the Percentage of Overconsumption with the Simulation**





As per the previous figure, the average overestimation of energy consumption in HOT2000 simulations would be approximately 40 percent. This figure is considerably higher than typical acceptable inaccuracies of building energy software, which vary around 10 to 15 percent. Nevertheless, this percentage cannot be automatically applied to the calculated savings per EnerGuide point coefficient without taking into account the following considerations:

- > The fact that HOT2000 simulations tend to overestimate building energy consumption does not necessarily imply that the estimated savings per EnerGuide point are overestimated, and if such is the case, with the same percentage. In fact, the origin for consumption overestimation in the software is not defined. For example, HOT2000 could either oversize the space heating requirements or assume a base load consumption that is too large. These two explanations would have dissimilar effects on energy savings calculations. Therefore, it appears difficult to assess the potential impacts on the average savings per EnerGuide point coefficient to be used. With this in mind, Econoler believes that additional comparative analyses should be done to fine-tune the percentage value for adjusting the calculated savings per EnerGuide point.
- > The overestimation percentages vary significantly; i.e., from 8 percent to more than 70 percent. With this in mind, the sample of 17 projects may not be considered as being large enough for calculating a reliable adjustment factor.

In light of the above, Econoler elected to adopt a conservative approach and proposed using an adjustment factor of 25 percent for calibrating the simulated saving per EnerGuide point value. Since 16 of the 17 pairs of data compared demonstrate a difference in percentage of 25 percent or higher, using such a coefficient can be considered as fairly reasonable. Noteworthy is that this analysis did not show any relevant relationship between the EnerGuide rating and the percentage of overestimation. In other words, the overestimation of energy consumption in HOT2000 simulations ranged from 8 to 71 percent with no relation to either the initial or final EnerGuide ratings of each project.

Finally, lowering the evaluated average savings per EnerGuide point (1,089 kWh) by 25 percent gives a final value of **817 kWh** of savings per EnerGuide point.

#### **4.2.2 Prescriptive Measure Savings**

When reviewing the 2010 evaluation report, Econoler noted the six prescriptive measures for which energy savings were taken into account independently from the savings per EnerGuide point coefficient. Then, Econoler conducted a series of tests with HOT2000 simulations in order to confirm whether the savings of these prescriptive measures were actually captured in the savings per EnerGuide point coefficient. As mentioned previously, the sample project simulations include at least one of each prescriptive measure. Starting with the HOT2000 simulations created by the energy

advisors, the Evaluator tracked the variations of project impacts depending on whether these prescriptive measures were included in the modelling.

The next table highlights which of the six prescriptive measures actually generated energy savings in HOT2000 simulations.

**Table 25: Modification of the Electricity Consumption in HOT2000 Results**

| <b>Prescriptive Measures</b>                                     | <b>Electricity Consumption Results</b>                             |
|------------------------------------------------------------------|--------------------------------------------------------------------|
| Drain water heat recovery with more than 42% efficiency          | No modification                                                    |
| Drain water heat recovery with an efficiency between 30% and 42% | No modification                                                    |
| Electric hot water heater pipe insulation                        | No modification                                                    |
| Electric hot water heater tank wrap                              | Reduction of electricity consumption (if electrical space heating) |
| Programmable thermostats                                         | No modification                                                    |
| Solar DHW                                                        | Reduction of electricity consumption (if electrical space heating) |

In conclusion, four prescriptive measures have to be evaluated separately from the EnerGuide point analysis. Their gross savings will be calculated using a unitary savings value for each project where these measures are implemented. HOT2000 simulations include savings of the two other prescriptive measures (solar DHW and hot water tank insulation) as long as the building space heating system is electrically powered (at least partially). If such was not the case, Econoler had to consider additional electricity savings for these two prescriptive measures.

The next sections present the analysis conducted by Econoler to validate the energy savings coefficient to be used for each prescriptive measure.

### **Drain water heat recovery with more than 42 percent efficiency**

For this product, ENSC uses a unitary savings value of 1,026 kWh per year for each installed system. This value is based on the 2010 EEH program impact evaluation report. In its impact evaluation, Econoler consulted the 2011 OPA report, which contains the unitary savings analysis of DWHR systems for residential uses (the last revision of this analysis was in May 2008). This analysis was made for DWHR pipe of 60 percent efficiency to be installed in houses with a single electric water heater.

In more detail, the OPA report estimates the average household use between 1.5 and 1.8 showers per day. For its calculations, the OPA, however, considered a high use case. Accordingly, the shower rate was assumed to be three per day, eight minutes per shower. The estimated shower flow was 6.5 liters

per minute, which can be deemed a rather low flow. For the initial water temperature calculations, the OPA used the Toronto groundwater temperature.

As a result, the OPA found electricity savings of 816 kWh per year for each installed unit. Econoler elected to use the value calculated in the 2011 OPA report (816 kWh of annual savings per installed unit) in its gross savings calculations.

### **Drain water heat recovery with an efficiency between 30 and 42 percent**

For this product, ENSC uses a unitary savings value of 820 kWh per year for each installed system. This value is based on the 2010 EEH program impact evaluation report. Since there was only one DWHR unit with an efficiency below 42 percent installed under the 2011 EEH program, the Evaluator did not conduct sound research for fine-tuning ENSC's unitary savings value. For its 2011 impact calculation, the Evaluator used the same unitary savings value for this measure as that used for the DWHR units with more than 42 percent efficiency; i.e., 816 kWh per year for each installed system.

### **Electric hot water heater pipe insulation**

The EEH program proposes the installation of water heater pipe insulation where the domestic hot water is electrically heated. For this product, ENSC uses a unitary savings value of 74 kWh per 10 feet of insulation per year, based on the 2010 EEH program impact evaluation report. Initially, the annual savings value used by ENSC assumed that pipe insulation was installed on a 1.5-inch pipe. In 2009, the evaluation revised the savings value to use a 0.75-inch pipe, which was considered to be more common in residential applications. Econoler decided to keep this unitary savings value of 74 kWh per year since it is consistent with the insulated pipe size found in the OPA report.

### **Electric hot water heater tank wrap**

For this product, ENSC uses a unitary savings value of 399 kWh per year for each installed system. This value was used in the 2010 EEH program impact evaluation report and is based on the 2009 impact evaluation report of the Low Income program.

As a second source, Econoler consulted the OPA report. In the 2011 version, the installation of water heater blankets in the residential market was analyzed. The annual unitary savings for both single- and multi-family households were estimated at 270 kWh. Since the assumptions used by the OPA to estimate this unitary savings value are clear, well documented and reliable, Econoler decided to use the unitary savings value of 270 kWh per year for this evaluation.

## Programmable thermostats

For programmable thermostats, ENSC uses a unitary savings value of 63.15 kWh per year. This value comes from the OPA report. The baseline corresponds to a standard electronic thermostat. As a result, the energy savings are calculated from the temperature set back that can be set at night with a programmable thermostat. To do so, the OPA considered a savings value of 1 percent for every degree set back<sup>12</sup>.

In the Retail Markdown program evaluation, Econoler reviewed another study to adjust the unitary savings value used for programmable thermostats. The 2009 evaluation of Hydro-Québec's Residential Electronic Thermostats in New Construction program<sup>13</sup> estimated the energy savings generated by the thermostat accuracy and by the temperature set back. The table below presents the results of this evaluation.

**Table 26: Main Outputs from Hydro-Québec's Evaluation of Electronic Thermostat Savings**

| Calculation Parameters                                                               | Housing Type    |                              |           |
|--------------------------------------------------------------------------------------|-----------------|------------------------------|-----------|
|                                                                                      | Single Detached | Duplex / Triplex / Townhouse | Apartment |
| Gross Energy Savings for Electronic Thermostat Accuracy                              |                 |                              |           |
| Percentage of savings due to the thermostat accuracy                                 | 9.0%            | 5.5%                         | 4.5%      |
| Annual consumption for electric space heating (before thermostat installation) [kWh] | 12,542          | 7,734                        | 4,782     |
| Savings per housing [kWh]                                                            | 1,129           | 425                          | 215       |
| Number of thermostats per housing                                                    | 9.36            | 4.52                         | 3.55      |
| Savings per thermostat [kWh]                                                         | 121             | 94                           | 61        |
| Gross Energy Savings for Temperature Set Back with Programmable Thermostats          |                 |                              |           |
| Savings per housing [kWh]                                                            | 434             | 333                          | 225       |
| Number of programmable thermostats per housing                                       | 4.33            | 1.66                         | 1.91      |
| Savings per thermostat [kWh]                                                         | 100             | 201                          | 118       |

<sup>12</sup> U.S. Department of Energy, Energy Savers – Thermostats and Control Systems, [www.energysavers.gov](http://www.energysavers.gov), Last update: 2011-09-02.

<sup>13</sup> Econoler, Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel, Final Report presented to Hydro-Québec, February 9, 2009.

For the savings calculation due to the electronic thermostat accuracy, the percentages of savings were based on research supervised by Hydro-Québec's laboratory of energy technologies (LTE)<sup>14</sup>. The research used test results captured in LTE's environmental chambers and in single-family homes by comparing the operation of bimetallic thermostats versus electronic thermostats and the consumption of houses with bimetallic thermostats versus electronic thermostats. The annual consumption for electric space heating was estimated through a billing analysis including 25,703 clients and 206,861 billing periods.

For the savings calculation due to the temperature set back, the savings per housing resulted from a billing analysis regression which compared the consumption of houses with electronic thermostats and houses with programmable thermostats.

As the unitary savings value of 63.15 kWh currently used by ENSC is a theoretical value based on an engineering calculation, Econoler considers more adequate to use the results from the LTE tests conducted in environmental chambers and in single-family homes as well as the billing analysis from Hydro-Québec's evaluation report. Moreover, said report includes the savings due to the higher level of accuracy obtained from the replacement of an old bimetallic thermostat with an electronic model. Since the field data from the Efficient Products – Direct Install (EP-DI) program shows that the baseline in the Nova Scotia residential market should be established as bimetallic thermostats, Econoler considers that these savings should be added to the temperature set back savings.

To make these savings applicable to the programmable thermostats sold through the EEH program, there was a need to adjust these values on the basis of the proportion of housing type in Nova Scotia's residential market. However, the program tracking sheet did not provide information on the share of each housing type. In addition, the PM confirmed that single-detached houses account for the bulk of 2011 program participants. Since the programmable thermostats installed in single-detached houses generate less savings than those installed in duplex, triplex or townhouses (respectively 221 kWh per year and 295 kWh per year), it is deemed a conservative assumption to consider that 100 percent of all participants resided in single-detached houses.

In light of the above, Econoler estimated the total unitary savings value associated with the installation of a programmable thermostat at 221 kWh per year. This latter figure was used in the EEH program impact evaluation for 2011.

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<sup>14</sup> Hydro-Québec – Laboratoire des technologies de l'énergie (LTE), Sommaire exécutif de rapports publiés par Hydro-Québec concernant les économies d'énergie dues aux thermostats électroniques, October 2004.

## **Solar DHW**

For this product, ENSC uses a unitary savings value of 2,080 kWh per year for each installed system. This value is based on the 2010 EEH program impact evaluation report.

For 2011 EEH program impact evaluation, Econoler consulted the 2011 OPA report, which contains a unitary savings analysis of solar thermal water heater systems for residential purposes. This analysis was made for electric storage water heaters paired with solar DHW.

In more detail, the OPA report estimates the average size of standard hot water tanks to 50 US gallons. A seasonal savings pattern was also generated for each housing sector based on a hot water usage profile defined in the Building America Performance Analysis<sup>15</sup>.

Moreover, the OPA estimated the energy production potential of a solar thermal system using Solar Rating and Certification Council (SRCC)<sup>16</sup> data. The SRCC only provides performance estimation for various locations in the United States. For its calculations, the OPA elected to use the savings figures of all rated systems in Rochester, New York. Then, the OPA used a weather factor to convert the results for Rochester to Toronto. Finally, the OPA calculated the annual savings of a solar DHW system for Toronto, namely 1,713 kWh/yr.

To transpose OPA results to Nova Scotia, Econoler first assumed that the hot water usage profile was similar to Ontario's and thus did not require adjustment. Then, Econoler adjusted the unitary annual savings per panel using the annual daily solar radiation at horizontal (in kWh/m<sup>2</sup>/day). The daily solar radiation at horizontal is a good indicator of solar energy received on average for each month. These data come from the National Aeronautics and Space Administration (NASA)<sup>17</sup>. In Toronto, the daily solar radiation on a horizontal surface varies from 1.05 kWh/m<sup>2</sup>/day in December to 6.09 kWh/m<sup>2</sup>/day in July, with an annual average of 3.59 kWh/m<sup>2</sup>/day. In Halifax, this average solar radiation level is 3.4 kWh/m<sup>2</sup>/day (ranging from 1.18 kWh/m<sup>2</sup>/day in December to 5.44 kWh/m<sup>2</sup>/day in June). The average difference between the two locations is 5.3 percent. Accordingly, Econoler reduced the annual savings of a residential solar DHW system in Toronto by 5.3 percent to obtain the unitary annual savings to be used for Nova Scotia; i.e., 1,622 kWh/year for each installed unit.

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<sup>15</sup> Daily Water Use Profile, Building America Performance Analysis. 2010, [http://www1.eere.energy.gov/buildings/building\\_america/perf\\_analysis.html](http://www1.eere.energy.gov/buildings/building_america/perf_analysis.html).

<sup>16</sup> SRCC Annual Performance Search, [http://securedb.fsec.ucf.edu/srcc/annual\\_search](http://securedb.fsec.ucf.edu/srcc/annual_search), accessed on 22/07/2010.

<sup>17</sup> NASA Surface Meteorology and Solar Energy Data Set website: <http://eosweb.larc.nasa.gov/sse/RETScreen>.

### **4.2.3 Pilot Project Savings**

The Standard Direct Install pilot project and the Direct Install Plus pilot project include the following products:

- > 13 W CFLs;
- > 23 W CFLs;
- > LEDs less than 10 W;
- > LEDs greater than 10 W;
- > LED night lights;
- > Electric kettles;
- > CFL compatible lamps;
- > Faucet aerators;
- > Low flow showerheads;
- > pipe wraps;
- > DHW tank wraps.

The gross energy savings are calculated by multiplying the number of installed products by the savings per product.

To avoid double-counting the savings, the products installed either through the pilot projects or as prescriptive measures in the standard program were removed from the program tracking sheet as soon as the pilot projects would start. The two energy-efficient products subject to double-counting were pipe insulation and hot water tank wraps.

The next sections present the analysis conducted by Econoler to validate the energy savings coefficient to be used for each Direct Install pilot project product.

### **13 W CFLs**

According to the ENERGY STAR® light output equivalency table, a 13 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Thus, the replacement of a 60 watt incandescent lamp for a 13 watt CFL is considered the base case for this product and corresponds to a displaced wattage of 47 W.

As for all ENSC residential programs, Econoler adjusted the daily usage of 13 watt CFLs, estimated at 2.4 hours based on participant declarations during a telephone survey, to 2.7 hours. This value is based on a metering study conducted for Hydro-Québec's residential lighting program<sup>18</sup>. When available, metering data should always be prioritized instead of using estimations from a self-

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<sup>18</sup> For more details about CFL hours of operation, see the Retail Markdown Program 2011 evaluation report.

declaration approach where many behavior factors can influence the respondents' answers. Hence, Econoler considers more accurate to use the daily usage of 2.7 hours from Hydro-Québec's metering study.

The review resulted in a unitary savings value for 13 watt CFLs of 46.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 13 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 46.3 \frac{\text{kWh}}{\text{yr}}$$

## 23 W CFLs

For approximating the unitary savings value for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the actual wattage of the CFLs (23 W) and the average wattage of the incandescent lamps typically replaced by such CFLs. Based on the data collected through the Efficient Products – Direct Install program for residential buildings, Econoler estimated that old incandescent lamps replaced by 23 watt CFLs have an average wattage of 93.5 W. This value is consistent to what is found on the market. In fact, according to the ENERGY STAR light output equivalency table, 23 watt CFLs are comparable to 75 or 100 watt incandescent lamps. However, incandescent lamps of 75 watts are rarely available on the market and manufacturers indicate more often that the light output of a 23 watt CFL is sufficient to replace a 100 watt incandescent lamp. Thus, Econoler considers adequate using an average replaced wattage of 93.5 W resulting in an average displaced wattage of 70.5 W.

As for 13 watt CFLs, the daily usage of 23 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

The review resulted in a unitary savings value for 23 watt CFLs of 69.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

## CFL Compatible Floor Lamps (CFL torchieres)

ENSC estimated the unitary savings for CFL torchieres at 241 kWh per year. This figure was based on the Navigant study mentioned earlier. The assumptions used to estimate this value were not available. Therefore, Econoler based its review on other studies and assumptions.

As for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the average wattage of CFL torchieres installed through the pilot project (23 W) and the average wattage of the incandescent lamps typically replaced by 23 watt CFLs (93.5 W). Thus, the



average displaced wattage is 70.5 watts. For the hours of operation, Econoler used the same daily usage of 2.7 hours, as was the case with CFLs.

Using these assumptions, the annual unitary savings value for CFL torchieres was calculated based on the equation below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

Therefore, the unitary savings estimation of 241 kWh was adjusted to 69.5 kWh.

## LEDs

ENSC did not record the power capacity of the installed LEDs. Therefore, Econoler based the energy savings evaluation on the average power given by ENSC; i.e., 7 watts per LED. This value was used as an average for the three LED components of the pilot projects, namely for “LEDs less than 10 watt” and “LEDs greater than 10 watt” (Standard Direct Install) as well as for “LED bulbs” (Direct Install Plus). According to ENERGY STAR, a 7 watt LED provides around 240 lumens which corresponds to a 40 watt incandescent lamp. A Pacific Gas and Electric Company study<sup>19</sup> also shows that, based on major manufacturers specifications, a 7 watt LED usually replaces a 40 W incandescent bulb. As the two data are comparable, Econoler decided to calculate the unitary savings for this product through the replacement of a 40 watt incandescent bulb with a 7 watt LED. Thus, the replacement of a 40 watt incandescent lamp for a 7 watt LED is considered the base case for this product and corresponds to a displaced wattage of 33 W.

As for all ENSC residential programs, Econoler adjusted the daily usage of 7 watt LEDs, estimated at 2.4 hours based on participant declarations during a telephone survey, to 2.7 hours. This value is based on a metering study conducted for Hydro-Québec’s residential lighting program<sup>20</sup>. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behavior factors can influence the respondents’ answers. Hence, Econoler considers more accurate to use the daily usage of 2.7 hours from Hydro-Québec’s metering study.

The review resulted in a unitary savings value for 7 watt LEDs of 32.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(40 \text{ W} - 7 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 32.5 \frac{\text{kWh}}{\text{yr}}$$

<sup>19</sup> Pacific Gas and Electric Company (PG&E), LED replacement lamps, Business Fact Sheet, 2010.

<sup>20</sup> For more details about CFL hours of operation, see the Retail Markdown Program 2011 evaluation report.

## LED Nightlights

Based on a technical reference manual from the Pennsylvania Public Utility Commission<sup>21</sup>, ENSC estimates a unitary savings value of 26 kWh for the installation of LED nightlights. The assumptions behind this savings calculation are presented in the next table.

**Table 27: Unitary Savings Estimation for LED Nightlights**

| Parameters                             | Values        |
|----------------------------------------|---------------|
| Old Wattage (incandescent nightlights) | 7 W           |
| New Wattage (LED nightlights)          | 1 W           |
| Average Displaced Wattage              | 6 W           |
| Operating Time                         | 12 h/day      |
| <b>Annual Savings</b>                  | <b>26 kWh</b> |

LED nightlights installed under the program have a wattage value of 0.3 W. They are used to replace old nightlights which are traditionally made of a 7 W incandescent light. Such replacement results in an average displaced wattage of 6.7 W, which will be used by Econoler for this evaluation.

The 12-hour/day operation time used by the Pennsylvania Public Utility Commission represents a nightlight that is turned on all night. Econoler could not find any other jurisdiction to support this value. However, the Evaluator considers that the 12-hour value is adequate. The LED nightlights installed through the program are equipped with a sensor that automatically turns on the nightlight when it is dark. Therefore, the nightlights installed in rooms that are not affected by daylight are likely to remain on for several hours during the day. For nightlights installed in rooms affected by daylight, there is a potential operating time of 11.8 hours per day since the average time of illumination in Halifax is 12.2 hours per day<sup>22</sup>. Another element justifying the operating time of 12 hours lies in the fact that on-site visits results provide for an average usage of 11.8 hours a day, based on participant declarations.

Using a displaced wattage of 6.7 W and an average operating time of 12 hours a day, Econoler calculated a unitary savings value of 29.3 kWh. This value will be used in the gross savings calculations for the installation of LED nightlights.

<sup>21</sup> Pennsylvania Public Utility Commission, "Technical Reference Manual," Pennsylvania, June 2011.

<sup>22</sup> National Research Council Canada, Sunrise/Sunset Calculator, Standard times of solar rise for Halifax, Nova Scotia, 2011, [www.nrc-cnrc.gc.ca](http://www.nrc-cnrc.gc.ca).

## Electric Kettles

For electric kettles, ENSC uses a unitary savings value of 49 kWh. This savings value is based on the Navigant study for which the calculation details were not available. As Econoler was unable to find secondary information on energy savings estimations for electric kettles, the unitary savings value of 49 kWh per year was maintained since it is consistent with the value used in previous evaluations of the Low Income Homeowner program.

## Faucet Aerators (kitchens and bathrooms)

The unitary savings value for faucet aerators is estimated at 86 kWh, based on the Navigant study. However, the assumptions used to estimate this value are not available; as a result, Econoler relied on other studies and assumptions to conduct its evaluation.

To calculate the unitary savings value, Econoler reviewed two studies estimating the annual value for the installation of faucet aerators.

**Table 28: Unitary Savings Estimate for Faucet Aerators from Other Jurisdictions**

| Annual Unitary Savings | Source                                             |
|------------------------|----------------------------------------------------|
| 176.30 kWh             | OPA                                                |
| 159.1 kWh              | Wisconsin Focus on Energy Evaluation <sup>23</sup> |

The annual unitary savings value presented in the table above is an average savings value per faucet, calculated from three faucets, one installed in the kitchen and two in the bathrooms. The on-site visit results from the 2011 evaluation of the Efficient Products – Low Income Renter Program revealed that, in most cases, faucet aerators are installed in one kitchen and one bathroom for the same house. Since the savings are higher for faucet aerators installed in kitchens as opposed to bathrooms, the assumption used to establish an average value is conservative.

Both studies used a base flow rate of 2.2 gpm reduced by 31.8 percent to 1.5 gpm, which is adequate. The narrow gap between both values is primarily due to a difference between the average hot water usage assumptions. Econoler used the OPA unitary savings since a comparison with a Canadian province is more appropriate and because many unitary savings from the OPA are already deemed acceptable for most products promoted through ENSC programs. Therefore, the unitary savings value that will be used in the current evaluation is 176.30 kWh per year.

<sup>23</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.

## Low-Flow Showerheads

For low-flow showerheads, ENSC uses a unitary savings value of 157 kWh. This savings value is based on the Navigant study for which the calculation details were not available. Therefore, Econoler had to rely on other sources of data to review the unitary savings generated by the installation of low-flow showerheads. In the OPA report, the annual savings for low-flow showerheads are calculated using the assumptions below.

**Table 29: OPA Unitary Savings Estimate for Low-Flow Showerheads**

| Parameters                                  | Values                       |
|---------------------------------------------|------------------------------|
| Typical Flow Rate for a Low-Flow Showerhead | 4.73 L/min (1.25 gpm)        |
| Average Flow Rate for a Regular Showerhead  | 7.57 L/min (2.0 gpm)         |
| Average Number of Showers Taken             | 2.3 showers/day/household    |
| Average Showering Time                      | 7.5 minutes                  |
| Average Shower Temperature                  | 40°C (104°F)                 |
| <b>Annual Savings</b>                       | <b>377 kWh per household</b> |

Econoler considers these parameters reliable and conservative. On its website, NRCAN promotes the installation of low-flow showerheads<sup>24</sup>. NRCAN specifies that these showerheads range from as low as 3.8 litres per minute to 9.5 litres per minute, with the most common around five litres per minute. This value is close to that used by the OPA in its assumption for a typical low-flow showerhead rate. Using its assumptions, NRCAN calculates an annual savings value of 377 kWh per household, similar to the OPA's.

Finally, since the average number of showerheads installed through the program is equal to 1.01 units per household, Econoler concludes that the annual savings value of 377 kWh can be used as a unitary savings value per low-flow showerhead.

## Pipe Insulation and Hot Water Tank Wraps

The analysis conducted to evaluate the energy savings of these two measures is described in Section 4.2.2.

<sup>24</sup> Natural Resources Canada, Personal: Residential – Better Water Use Means Bigger Savings, [www.oeo.nrcan.gc.ca](http://www.oeo.nrcan.gc.ca).

#### **4.2.4 Demand Savings**

The demand savings of the EEH program are calculated using two different considerations. Firstly, Econoler calculated the demand savings for the EEH program using an energy-to-demand ratio of 3.64 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings (in GWh) by the target peak demand savings (in MW). The use of this ratio for demand savings calculations was also confirmed by ENSC.

Secondly, Econoler added to this calculated demand savings value the estimated amount of demand savings realized through the installation of electric thermal storage (ETS) units. ETS units are systems that reduce electricity demand by storing heat during off-peak demand hours of the day and releasing it during on-peak hours. In the EEH program, three ETS measures are approved for implementation in residential buildings, namely ETS forced air furnaces, ETS central hydronic systems and ETS room units. Econoler added the demand savings generated through the installation of ETS units to the demand savings calculated using the energy-to-demand ratio<sup>25</sup>.

For the first two ETS units (forced air furnaces and central hydronic systems), ENSC used an average demand savings per system of 45 kW. The reference for this value was not confirmed. Econoler considers that this estimate is not conservative and should be reduced significantly. A typical residential building in Nova Scotia would have between 7 to 20 kW<sup>26</sup> of electrical heating capacity installed to meet peak heating requirements. With such heating capacity installed, it is impossible to generate 45 kW of demand savings. In comparison, the input power of some of the largest residential forced air furnaces and central hydronic systems with ETS units to be found on the market range approximately from 38 to 45 kW.<sup>27</sup> To be conservative, the specifications for small- to medium-sized heating systems should have been used (between 14 and 30 kW). Similarly, ENSC proposed using a demand savings value for all ETS room units of 10 kW. Since the input power of such units on the market is around 1 to 11 kW,<sup>27</sup> this assumption cannot be considered conservative.

In addition to the above considerations, Econoler noted that the demand savings coefficients proposed by ENSC do not take into consideration any diversity factor. In this particular case, an appropriate diversity factor should take into account the operation mode of standard electrical heating systems (base case), which do not operate continuously but on a cyclic basis (full load/partial load/off) depending on heat requirements.

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<sup>25</sup> In January 2012, the firm Navigant confirmed that ETS unit demand savings were not included in the calculation of 2011 energy and demand savings targets.

<sup>26</sup> This assumption is based on heating load curves of CanmetEnergy (Community Energy Technologies, CanmetEnergy Technology Centre-Ottawa, Natural Resources Canada, 1997) and heating load calculation basics of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE, ASHRAE Handbook, Fundamentals Volume, 2009).

<sup>27</sup> Examples of such systems can be found on this manufacturer website: <http://www.steffes.com/off-peak-heating/residential-systems.html>.

To find a more appropriate unitary demand savings figure for each ETS system, Econoler analyzed the installed heating capacity of the 25 sample HOT2000 simulations used for fine-tuning the energy savings per EnerGuide point value (Section 4.2.1). The equation used by HOT2000 to define the output capacity of the space heating system is shown below.

$$\text{Calculated output capacity} = \text{design heat loss} * 1.10 + 0.5 \text{ kW}$$

The results for the 25 D-audit models show a distribution of the output heating capacity between 7 kW and 18.5 kW, with two outlier values at 2.5 kW and 35 kW of installed heating capacity. Taking into account all the data, the average heating capacity of the studied houses was 12.5 kW. In other words, this value would be the average maximum potential demand savings per house to be realized as a result of the installation of ETS systems.

In addition to the maximum output heating capacity, Econoler considered a diversity factor of 80 percent in its ETS demand savings calculation. This value was estimated considering that the installed heating systems in households usually have higher capacity than the annual peak requirements (safety factor) and that the electric heating systems do not operate continuously but rather cycle over time. On the other hand, Econoler selected a high diversity factor since the peak demand period in Nova Scotia takes place during the coldest part of the year, when most of all heating systems are likely to operate at a rather high loading.

Econoler proposed using these two data (maximum heating output capacity of 12.5 kW and diversity factor of 80%) for the calculation of ETS system unitary savings. For the ETS units installed on central heating systems (either forced air furnaces or central hydronic systems), Econoler therefore assumed the unitary peak demand savings for the latter ETS units to be 10 kW.

Regarding the ETS room units, Econoler decided to use a maximum unitary savings of 5 kW, considering that this type of system is likely to be installed in the largest rooms of the houses and thus would generate an important part of the potential demand savings of the buildings. Using the same diversity factor (80%), Econoler suggested using 4 kW per ETS room unit installed.

In summary, Econoler used the following annual demand savings for the installation of each type of ETS units:

- > ETS forced air furnaces: 10 kW per project;
- > ETS central hydronic systems: 10 kW per project;
- > ETS room units: 4 kW per unit, up to 10 kW per project.

#### **4.2.5 Revised Gross Savings**

Energy and demand savings for the program were revised to reflect the calibrated savings per EnerGuide rating point and the savings from prescriptive measures presented in Sections 4.2.2 and 4.2.4. For the calculation of savings at the generator level, Econoler used a line loss factor of 10.5 percent, which takes into account transmission and distribution losses. This value was provided by NSPI.

Taking everything into account, the 2011 overall gross energy savings for the EEH programs are respectively estimated at 6.740 GWh at the meter and at 7.447 GWh at the generator. Furthermore, the 2011 total gross peak demand savings for this program are respectively estimated at 2.140 MW at the meter and at 2.364 MW at the generator. The details of the total savings obtained for the EEH program are presented in the next table.

**Table 30: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                              | Savings per<br>EnerGuide<br>Point* | DWHR**<br>(eff. = 30%<br>to 42%) | DWHR**<br>(eff. ≥<br>42%) | Pipe<br>Insulation | Tank<br>Wraps*** | Program-<br>mable<br>Thermostat<br>s | Solar<br>DHW | 13 Watt<br>CFLs | 23 Watt<br>CFLs |
|---------------------------------------------------------------|------------------------------------|----------------------------------|---------------------------|--------------------|------------------|--------------------------------------|--------------|-----------------|-----------------|
| <b>Energy Savings</b>                                         |                                    |                                  |                           |                    |                  |                                      |              |                 |                 |
| Number of Units from EEH<br>Program Tracking Sheet            | 1,110                              | 1                                | 3                         | 217                | 61               | 1,930                                | 27           | --              | --              |
| Number of Units from Direct<br>Install Standard Pilot Project | --                                 | --                               | --                        | 314                | 304              | --                                   | --           | 2,341           | 120             |
| Number of Units from Direct<br>Install Plus Pilot Project     | --                                 | --                               | --                        | 435                | 305              | --                                   | --           | 14,022          | 1,325           |
| Number of Units                                               | 1,110                              | 1                                | 3                         | 966                | 670              | 1,930                                | 27           | 16,363          | 1,445           |
| Unitary Energy Savings (kWh)                                  | 817                                | 816                              | 816                       | 74                 | 270              | 221                                  | 1,622        | 46.3            | 69.5            |
| <b>Total Gross Energy Savings –<br/>at Meter (GWh)</b>        | <b>4.521</b>                       | <b>0.001</b>                     | <b>0.002</b>              | <b>0.071</b>       | <b>0.181</b>     | <b>0.427</b>                         | <b>0.044</b> | <b>0.758</b>    | <b>0.100</b>    |
| Line Loss Factor                                              | 1.105                              | 1.105                            | 1.105                     | 1.105              | 1.105            | 1.105                                | 1.105        | 1.105           | 1.105           |
| <b>Total Gross Energy Savings –<br/>at Generator (GWh)</b>    | <b>4.995</b>                       | <b>0.001</b>                     | <b>0.003</b>              | <b>0.079</b>       | <b>0.200</b>     | <b>0.471</b>                         | <b>0.048</b> | <b>0.837</b>    | <b>0.111</b>    |
| <b>Demand Savings</b>                                         |                                    |                                  |                           |                    |                  |                                      |              |                 |                 |
| Unitary Demand Savings (kWh)                                  | N/A                                | N/A                              | N/A                       | N/A                | N/A              | N/A                                  | N/A          | N/A             | N/A             |
| Energy-to-Demand Ratio<br>(GWh/MW)                            | 3.64                               | 3.64                             | 3.64                      | 3.64               | 3.64             | 3.64                                 | 3.64         | 3.64            | 3.64            |
| <b>Total Gross Demand Savings<br/>– at Meter (MW)</b>         | <b>1.242</b>                       | <b>0.0002</b>                    | <b>0.0007</b>             | <b>0.020</b>       | <b>0.050</b>     | <b>0.117</b>                         | <b>0.012</b> | <b>0.208</b>    | <b>0.028</b>    |
| Line Loss Factor                                              | 1.105                              | 1.105                            | 1.105                     | 1.105              | 1.105            | 1.105                                | 1.105        | 1.105           | 1.105           |
| <b>Total Gross Demand Savings<br/>– at Generator (MW)</b>     | <b>1.372</b>                       | <b>0.0002</b>                    | <b>0.0007</b>             | <b>0.022</b>       | <b>0.055</b>     | <b>0.129</b>                         | <b>0.013</b> | <b>0.230</b>    | <b>0.030</b>    |

\* In the "Savings per EnerGuide Point" column, the number of units is in fact the number of participants where a D audit was conducted and for which the Evaluator calculated savings per EnerGuide point. The unitary savings value shown in this column is the savings per EnerGuide point figure calculated through the EEH program impact evaluation.

\*\*DWHR: Drain Water Heat Recovery



\*\*\* Energy savings for hot water tank wraps were calculated only when there was no electrical space heating and when the water heating system was electric. For the participants who had not received a D audit report, the Evaluator calculated energy savings for hot water tank wraps in all houses that had an electric domestic water heater.

| Product Category                                           | CFL<br>Torchieres | LED<br>Nightlights | LED<br>Bulbs**** | Electric<br>Kettles | Faucet<br>Aerators | Low-Flow<br>Showerheads | ETS<br>Forced Air<br>Furnaces | ETS<br>Central<br>Hydronic<br>Systems | ETS Room<br>Units |
|------------------------------------------------------------|-------------------|--------------------|------------------|---------------------|--------------------|-------------------------|-------------------------------|---------------------------------------|-------------------|
| <b>Energy Savings</b>                                      |                   |                    |                  |                     |                    |                         |                               |                                       |                   |
| Number of Units from EEH Program Tracking Sheet            | --                | --                 | --               | --                  | --                 | --                      | 0                             | 3                                     | 66                |
| Number of Units from Direct Install Standard Pilot Project | --                | --                 | 521              | --                  | --                 | --                      | --                            | --                                    | --                |
| Number of Units from Direct Install Plus Pilot Project     | 26                | 1,550              | 140              | 78                  | 1,678              | 708                     | --                            | --                                    | --                |
| Number of Units                                            | 26                | 1,550              | 661              | 78                  | 1,678              | 708                     | 0                             | 3                                     | 66                |
| Unitary Energy Savings (kWh)                               | 69.5              | 29.3               | 32.5             | 49                  | 176                | 377                     | N/A                           | N/A                                   | N/A               |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>         | <b>0.002</b>      | <b>0.045</b>       | <b>0.021</b>     | <b>0.004</b>        | <b>0.296</b>       | <b>0.267</b>            | <b>N/A</b>                    | <b>N/A</b>                            | <b>N/A</b>        |
| Line Loss Factor                                           | 1.105             | 1.105              | 1.105            | 1.105               | 1.105              | 1.105                   | N/A                           | N/A                                   | N/A               |
| <b>Total Gross Energy Savings – at Generator (GWh)</b>     | <b>0.002</b>      | <b>0.050</b>       | <b>0.024</b>     | <b>0.004</b>        | <b>0.327</b>       | <b>0.295</b>            | <b>N/A</b>                    | <b>N/A</b>                            | <b>N/A</b>        |
| <b>Demand Savings</b>                                      |                   |                    |                  |                     |                    |                         |                               |                                       |                   |
| Unitary Demand Savings (kWh)                               | N/A               | N/A                | N/A              | N/A                 | N/A                | N/A                     | 10                            | 10                                    | 4                 |
| Energy-to-Demand Ratio (GWh/MW)                            | 3.64              | 3.64               | 3.64             | 3.64                | 3.64               | 3.64                    | N/A                           | N/A                                   | N/A               |
| <b>Total Gross Demand Savings – at Meter (MW)</b>          | <b>0.0005</b>     | <b>0.012</b>       | <b>0.006</b>     | <b>0.001</b>        | <b>0.081</b>       | <b>0.073</b>            | <b>0</b>                      | <b>0.030</b>                          | <b>0.258</b>      |
| Line Loss Factor                                           | 1.105             | 1.105              | 1.105            | 1.105               | 1.105              | 1.105                   | 1.105                         | 1.105                                 | 1.105             |
| <b>Total Gross Demand Savings – at Generator (MW)</b>      | <b>0.0005</b>     | <b>0.014</b>       | <b>0.007</b>     | <b>0.001</b>        | <b>0.090</b>       | <b>0.081</b>            | <b>0</b>                      | <b>0.033</b>                          | <b>0.285</b>      |

\*\*\*\* The "LED Bulbs" category of the above table includes all the LEDs less than 10 watts and greater than 10 watts (Standard Direct Install), as well as the LED bulb products (Direct Install Plus). All these LED products have the same evaluated unitary savings (in kWh). On the other hand, the "LED Nightlight" savings (Direct Install Plus pilot project) are shown in a separate column.

Even though the methodology used to calculate the gross savings is efficient, a number of adjustments could be made in the future to improve it. The Evaluator recommends that ENSC:

- > **Collect the building energy consumption data for each house:** The Evaluator recommends calculating the energy savings of each participant using the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.
- > **Conduct a more thorough billing analysis to evaluate the overestimation of energy consumption by HOT2000 with better precision:** The billing calibration developed in the 2011 evaluation revealed that HOT2000 tends to overestimate the house energy consumption. In the future, the Evaluator proposes developing a more comprehensive billing analysis to calculate an adjustment factor with a higher accuracy level. Using all participants from 2009, 2010 and 2011, a billing analysis could compare one full year of pre- and post-implementation energy consumption data with a view to establishing an adjustment ratio by comparing the HOT2000 expected savings to the actual reduction in participants' energy bills.
- > **Revise HOT2000 models on a random basis:** The Evaluator or the PM should revise a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.

## 4.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the EEH program, replacement of lighting products with CFLs or LEDs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, CFLs and LEDs release less heat than the less efficient lamps they replace.

For CFL and LED products installed through either Direct Install pilot project component, an interactive effects factor of -43.8 percent was used for this year's evaluation. To calculate this factor, Econoler

based its assessment on a study conducted by ADS in 1992 for Hydro-Québec.<sup>28</sup> The work performed in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2<sup>29</sup> software and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high. The scenario with minimum interactive effects was selected for 2011 program impact calculations because it enabled the Evaluator to account for the evolution of construction practices in the residential sector since 1992.

Then, the Evaluator adjusted the interactive effects factors from the ADS study using the proportion of space heating provided by electric systems among EEH program participants. The program tracking sheet showed the primary energy source used for space heating of each program participant (electricity, oil, natural gas, wood pellets, etc.). Econoler thus calculated the average percentage of electric heating in those participant houses, which resulted in 86.6 percent of program participant households being mainly heated with electric heating systems.<sup>30</sup> Subsequently, Econoler divided the houses mainly heated with electricity on the basis of whether they had air source heat pumps (ASHPs) or ground source heat pumps (GSHPs) installed (13.4% of total) or only electric baseboards (73.3% of total). For those who had an ASHP or a GSHP as their main heating system, Econoler used an average coefficient of performance (COP) of 4 to adjust the potential interactive effects on the electricity consumption of heating systems.

To take into account interactive effects on space cooling, Econoler adjusted the interactive effects factor in relation with the proportion of houses that had air conditioning units or systems installed. This percentage was taken from Statistics Canada,<sup>31</sup> which states that 18 percent of households have air conditioning in their residence.

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<sup>28</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

<sup>29</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>30</sup> For this calculation, 1,488 of the 1,494 participants of the EEH program had their primary space heating fuel written in the tracking sheet. A total of 1,289 of these participant houses were mainly heated with electric systems and 199 of them had either an ASHP or a GSHP installed through the program.

<sup>31</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

The following table presents the calculation details of the interactive effects. It reflects the proportion of residences in Nova Scotia that are mainly heated by electricity and those that have air conditioning units or systems.

**Table 31: Interactive Effects Factor for CFLs and LED Bulbs**

| Parameters                                             | % of Residences             | Interactive Effects |
|--------------------------------------------------------|-----------------------------|---------------------|
| Electric Baseboard Heating with Air Conditioning       | $73\% \times 18\% = 13.2\%$ | -54.4%              |
| Electric ASHP or GSHP Heating with Air Conditioning    | $13\% \times 18\% = 2.4\%$  | -10.9%              |
| Electric Baseboard Heating Without Air Conditioning    | $73\% \times 82\% = 60.1\%$ | -58.0%              |
| Electric ASHP or GSHP Heating Without Air Conditioning | $13\% \times 82\% = 11\%$   | -14.5%              |
| No Electric Heating with Air Conditioning              | $13\% \times 18\% = 2.4\%$  | 3.6%                |
| No Electric Heating Without Air Conditioning           | $13\% \times 82\% = 11\%$   | 0%                  |
| <b>Weighted Interactive Effects Factor</b>             | <b>100%</b>                 | <b>-43.8%</b>       |

For pipe insulation and hot water tank wraps installed through the EEH program and the Direct Install pilot project, interactive effects of -100 percent were considered during the heating period in electrically heated houses. This estimation is based on the fact that, when there is no insulation, all the heat lost through the pipes and the hot water tank is released into the room. It means that 100 percent of the energy released from the hot water is used for the heating load. Conversely, during the cooling period, interactive effects are estimated at +100 percent in houses that use air conditioning. Based on the heating and cooling degree-days for the region of Halifax<sup>32</sup>, Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation.

<sup>32</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.

The table below presents the details for the calculation of interactive effects for water pipe insulation and hot water tank wraps. As for lighting products, the table shows the proportion of residences in Nova Scotia that are heated electrically and those that use air conditioning units or systems. This calculation resulted in a weighted interactive effects factor of -48.3 percent.

**Table 32: Interactive Effects Factor for Pipe Insulation and Hot Water Tank Wraps**

| Parameters                                             | % of Residences             | Interactive Effects during Heating Period | Interactive Effects during Cooling Period |
|--------------------------------------------------------|-----------------------------|-------------------------------------------|-------------------------------------------|
| Electric Baseboard Heating with Air Conditioning       | $73\% \times 18\% = 13.2\%$ | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric ASHP or GSHP Heating with Air Conditioning    | $13\% \times 18\% = 2.4\%$  | $-25\% \times 8/12 = -17\%$               | $+100\% \times 2/12 = +17\%$              |
| Electric Baseboard Heating Without Air Conditioning    | $73\% \times 82\% = 60.1\%$ | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| Electric ASHP or GSHP Heating Without Air Conditioning | $13\% \times 82\% = 11\%$   | $-25\% \times 8/12 = -17\%$               | $0\% \times 2/12 = 0\%$                   |
| No Electric Heating with Air Conditioning              | $13\% \times 18\% = 2.4\%$  | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No Electric Heating Without Air Conditioning           | $13\% \times 82\% = 11\%$   | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>             | <b>100%</b>                 | <b>-51.4%</b>                             | <b>3.1%</b>                               |
|                                                        |                             | <b>-48.3%</b>                             |                                           |

For all other products installed, interactive effects were considered as negligible.

## 4.4 NET-TO-GROSS RATIO

The NTGR evaluation of the program is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on participants' decision to implement program-eligible energy efficiency measures. These questions were included in the participant survey.

This section presents the methodology used to transform responses to NTGR survey questions into a NTGR. For the program, the NTGR includes the assessment of two distortion effects: free-ridership and internal spillover. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ internal spillover})$$

#### **4.4.1 Free-Ridership**

In the EEH program, free-ridership can occur when participants declare they would have still implemented the energy efficiency measures in the absence of the program. The free-ridership level for this program was measured through participant surveys. The questionnaire included six questions that intended to assess:

- > if participants had any plans to implement energy efficiency measures before participating in the program;
- > the probability that participants would have implemented the same energy efficiency measures if they had not participated in the program;
- > the probability that participants would have installed standard equipment instead of energy-efficient equipment if they had not participated in the program;
- > the probability that participants would have implemented the same energy efficiency measures but at a later date if they had not participated in the program;
- > the probability that participants would have paid the full cost of the energy efficiency measures implemented through the program if it had not been in place; and
- > the influence of the program on participants' decision to implement energy efficiency measures.

Each group of questions was transposed into a level of program attribution which was used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix VIII.

The most important elements of the approach previously used to estimate the free-ridership level of the program were preserved in Econoler's approach. However, the following enhancements were incorporated:

- > Introduction of a 0 to 10 scoring system rather than fixed categories that were assigned weights.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participant energy efficiency decision making rather than focusing narrowly only on their rating of program importance. This question structure more accurately reflects the complex nature of real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania.

Using this approach, survey results revealed a free-ridership level of 31 percent for the program. This free-ridership level is slightly higher than the result obtained during last year's evaluation; i.e., 24 percent. This difference in free-ridership level may be partially due to the enhancements made to the approach for evaluating the free-ridership level.

#### **4.4.2 Internal Spillover**

The participant survey was also used for assessing internal spillover. In the case of the EEH program, internal spillover can occur when participants declare that, following their previous participation, they implemented additional energy efficiency measures that were recommended in their initial energy audit. When such was the case, additional questions were used to identify the additional energy efficiency measures implemented and to verify their validity by asking if participants benefited from rebates from other ENSC programs. Subsequently, other questions were asked to quantify the level of influence the program had on their decision to implement these additional measures. Depending on the level of influence obtained during the survey, a portion of the savings related to the additional measures was attributed to the program.

The level of internal spillover was calculated for each participant according to the equation below. The energy savings (kWh) associated with the additional energy efficiency measures are estimated using the savings estimations provided in the tracking sheet.

$$\%SO = \frac{kWh \text{ associated with the additional measures} \times \text{attribution level}}{kWh \text{ associated with the program participation}}$$

Past evaluations did not capture any internal spillover for this program. This year, the impact evaluation revealed an extremely low level of internal spillover. Only one participant out of the 70 surveyed participants declared having implemented an additional energy efficiency measure in their house, following their previous participation in the program, namely programmable thermostats. This additional energy efficiency measure accounted for approximately 0.5 percent of total gross energy savings for the sample.<sup>33</sup> This percentage corresponds to energy savings at the generator attributable to the program totalling approximately 37.3 MWh.

For the 2011 program impact evaluation, Econoler therefore considers an internal spillover level of 1 percent in its calculations.

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<sup>33</sup> For this calculation, the Evaluator assumed that there were 6.2 programmable thermostats installed, which is the average number of thermostats installed per house for the EEH program in 2011. Then, the unitary savings value of 221 kWh was used for each programmable thermostat installed. The attribution level of the participants was 90 percent and the total gross energy savings at the meter for the sample were approximately 246.8 MWh.

## **4.5 NET SAVINGS**

The net savings for the program were estimated using the interactive effects factors and the NTGR above. The equation below was used to calculate the net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

This equation was used for both demand and energy savings. The results obtained are presented in the next table.



**Table 33: Evaluation Results – Net Energy and Demand Savings**

| Product Category                                         | Savings per<br>EnerGuide<br>Point | DWHR<br>(eff. = 30%<br>to 42%) | DWHR<br>(eff. ≥<br>42%) | Pipe<br>Insulation | Tank<br>Wraps | Program-<br>mable<br>thermostats | Solar<br>DHW | 13 Watt<br>CFLs | 23 Watt<br>CFLs |
|----------------------------------------------------------|-----------------------------------|--------------------------------|-------------------------|--------------------|---------------|----------------------------------|--------------|-----------------|-----------------|
| <b>Energy Savings</b>                                    |                                   |                                |                         |                    |               |                                  |              |                 |                 |
| Total Gross Energy Savings – at<br>Meter (GWh)           | 4.521                             | 0.001                          | 0.002                   | 0.071              | 0.181         | 0.427                            | 0.044        | 0.758           | 0.100           |
| Interactive Effects Factor                               | 0%                                | 0%                             | 0%                      | -48.3%             | -48.3%        | 0%                               | 0%           | -43.8%          | -43.8%          |
| NTGR                                                     | 0.70                              | 0.70                           | 0.70                    | 0.70               | 0.70          | 0.70                             | 0.70         | 0.70            | 0.70            |
| <b>Total Net Energy Savings<br/>(GWh) – at Meter</b>     | <b>3.164</b>                      | <b>0.001</b>                   | <b>0.002</b>            | <b>0.026</b>       | <b>0.065</b>  | <b>0.299</b>                     | <b>0.031</b> | <b>0.298</b>    | <b>0.040</b>    |
| Line Loss Factor                                         | 1.105                             | 1.105                          | 1.105                   | 1.105              | 1.105         | 1.105                            | 1.105        | 1.105           | 1.105           |
| <b>Total Net Energy Savings<br/>(GWh) – at Generator</b> | <b>3.497</b>                      | <b>0.001</b>                   | <b>0.002</b>            | <b>0.029</b>       | <b>0.072</b>  | <b>0.330</b>                     | <b>0.034</b> | <b>0.329</b>    | <b>0.044</b>    |
| <b>Demand Savings</b>                                    |                                   |                                |                         |                    |               |                                  |              |                 |                 |
| Total Gross Demand Savings –<br>at Meter (MW)            | 1.242                             | 0.0002                         | 0.0007                  | 0.020              | 0.050         | 0.117                            | 0.012        | 0.208           | 0.028           |
| Interactive Effects Factor                               | 0%                                | 0%                             | 0%                      | -48.3%             | -48.3%        | 0%                               | 0%           | -43.8%          | -43.8%          |
| NTGR                                                     | 0.70                              | 0.70                           | 0.70                    | 0.70               | 0.70          | 0.70                             | 0.70         | 0.70            | 0.70            |
| <b>Total Net Demand Savings<br/>(MW) – at Meter</b>      | <b>0.869</b>                      | <b>0.0002</b>                  | <b>0.0005</b>           | <b>0.007</b>       | <b>0.018</b>  | <b>0.082</b>                     | <b>0.008</b> | <b>0.082</b>    | <b>0.011</b>    |
| Line Loss Factor                                         | 1.105                             | 1.105                          | 1.105                   | 1.105              | 1.105         | 1.105                            | 1.105        | 1.105           | 1.105           |
| <b>Total Net Demand Savings<br/>(MW) – at Generator</b>  | <b>0.961</b>                      | <b>0.0002</b>                  | <b>0.0005</b>           | <b>0.008</b>       | <b>0.020</b>  | <b>0.091</b>                     | <b>0.009</b> | <b>0.091</b>    | <b>0.012</b>    |

| Product Category                                     | CFL<br>Torchieres | LED<br>Nightlights | LED Bulbs    | Electric<br>Kettles | Faucet<br>Aerators | Low-Flow<br>Showerheads | ETS<br>Forced Air<br>Furnaces | ETS<br>Central<br>Hydronic<br>Systems | ETS Room<br>Units |
|------------------------------------------------------|-------------------|--------------------|--------------|---------------------|--------------------|-------------------------|-------------------------------|---------------------------------------|-------------------|
| <b>Energy Savings</b>                                |                   |                    |              |                     |                    |                         |                               |                                       |                   |
| Total Gross Energy Savings – at Meter (GWh)          | 0.002             | 0.045              | 0.021        | 0.004               | 0.296              | 0.267                   | N/A                           | N/A                                   | N/A               |
| Interactive Effects Factor                           | -43.8%            | -43.8%             | -43.8%       | 0%                  | 0%                 | 0%                      | N/A                           | N/A                                   | N/A               |
| NTGR                                                 | 0.70              | 0.70               | 0.70         | 0.70                | 0.70               | 0.70                    | N/A                           | N/A                                   | N/A               |
| <b>Total Net Energy Savings (GWh) – at Meter</b>     | <b>0.001</b>      | <b>0.018</b>       | <b>0.008</b> | <b>0.003</b>        | <b>0.207</b>       | <b>0.187</b>            | N/A                           | N/A                                   | N/A               |
| Line Loss Factor                                     | 1.105             | 1.105              | 1.105        | 1.105               | 1.105              | 1.105                   | N/A                           | N/A                                   | N/A               |
| <b>Total Net Energy Savings (GWh) – at Generator</b> | <b>0.001</b>      | <b>0.020</b>       | <b>0.009</b> | <b>0.003</b>        | <b>0.229</b>       | <b>0.206</b>            | N/A                           | N/A                                   | N/A               |
| <b>Demand Savings</b>                                |                   |                    |              |                     |                    |                         |                               |                                       |                   |
| Total Gross Demand Savings – at Meter (MW)           | 0.0005            | 0.012              | 0.006        | 0.001               | 0.081              | 0.073                   | 0                             | 0.030                                 | 0.258             |
| Interactive Effects Factor                           | -43.8%            | -43.8%             | -43.8%       | 0%                  | 0%                 | 0%                      | 0%                            | 0%                                    | 0%                |
| NTGR                                                 | 0.70              | 0.70               | 0.70         | 0.70                | 0.70               | 0.70                    | 0.70                          | 0.70                                  | 0.70              |
| <b>Total Net Demand Savings (MW) – at Meter</b>      | <b>0.0002</b>     | <b>0.005</b>       | <b>0.002</b> | <b>0.001</b>        | <b>0.057</b>       | <b>0.051</b>            | <b>0</b>                      | <b>0.021</b>                          | <b>0.181</b>      |
| Line Loss Factor                                     | 1.105             | 1.105              | 1.105        | 1.105               | 1.105              | 1.105                   | 1.105                         | 1.105                                 | 1.105             |
| <b>Total Net Demand Savings (MW) – at Generator</b>  | <b>0.0002</b>     | <b>0.005</b>       | <b>0.003</b> | <b>0.001</b>        | <b>0.063</b>       | <b>0.057</b>            | <b>0</b>                      | <b>0.023</b>                          | <b>0.200</b>      |

The Evaluator compared the net energy savings values calculated in the previous table with the EEH program tracked net savings for 2011. The next table details the final evaluated and tracked impacts for 2011.

**Table 34: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|-----------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                               |             |                    |
| Tracked Savings from ENSC | 8.506 GWh                    | 8.506 GWh                                     | 0.76        | 6.465 GWh          |
| <b>Evaluation Results</b> | <b>7.447 GWh</b>             | <b>6.864 GWh</b>                              | <b>0.70</b> | <b>4.805 GWh</b>   |
| <b>Demand Savings</b>     |                              |                                               |             |                    |
| Tracked Savings from ENSC | 3.226 MW                     | 3.226 MW                                      | 0.76        | 2.452 MW           |
| <b>Evaluation Results</b> | <b>2.364 MW</b>              | <b>2.204 MW</b>                               | <b>0.70</b> | <b>1.543 MW</b>    |

As per the last table, the evaluated net energy savings are lower than those tracked by ENSC by approximately 25 percent. This difference is mainly due to the adjustment made to the gross energy savings per EnerGuide point, from 1,047 kWh to 817 kWh saved per EnerGuide point. In addition, a number of unitary savings values related to the implementation of prescriptive measures were modified in accordance with up-to-date studies conducted at national level. Furthermore, Econoler made slight adjustments to the savings generated by the two pilot projects (Direct Install Standard and Direct Install Plus). Noteworthy is that the Direct Install Plus evaluated savings were slightly higher than ENSC's as a result of an increase in unitary savings related to aerator and CFL bulb installations.

Another reason to explain the drop in the evaluated net energy savings in comparison with ENSC's values is the addition of interactive effects to the savings related to the installation of energy-efficient lighting products and to the implementation of hot water tank and pipe insulation measures. Furthermore, the NTGR calculated for 2011 (0.70) is lower than that calculated as part of the 2010 program evaluation (0.76). This diminution of the program NTGR is particularly imputable to the changes in the approach to evaluating the free-ridership level.

With regard to net demand savings, the Evaluator made a relevant adjustment of ENSC's tracked savings, regardless of the fact that ENSC and Econoler used the same energy-to-demand ratio in their calculations. The reason for this is that Econoler adjusted significantly the unitary peak demand savings related to the installation of ETS systems. Econoler deemed that the unitary demand savings used by ENSC were not conservative and; consequently, the former conducted a short survey of building simulations to fine-tune the latter. As a result, these demand savings were reduced by more than 35 percent.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>1. Document important program assumptions or practices:</b></p> <ul style="list-style-type: none"> <li>- The program partners' specific roles and activities for a multi-component program should be described in detail in the program manual for future staff use.</li> <li>- For auditor training, the program manual should explain which organization provides the training and its approach.</li> <li>- The pre-retrofit evaluation ("D" Audit) is well explained in the program manual. However, the E and F types of audits (post-retrofit) could be further defined.</li> <li>- All rebates should have a source as to how they were calculated (incremental cost, payback period, etc.) and be included in the program manual so that both the Evaluator and the PM can track any modifications and their justification.</li> <li>- The unitary savings used for each prescriptive measure are available in the program tracking sheet. However, Econoler recommends adding this information in the program manual.</li> </ul> |
|                               | <p><b>2. Provide the parameters used to estimate the program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.</p>                                                                                                                                                                                                                           |
|                               | <p><b>3. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover an entire year of activities and be included in the program manual. The plans should also identify for each activity the performance indicators that should be collected for monitoring and evaluation purposes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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| <b>Program Manual Content</b> | <p><b>4. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing that would allow it to serve as “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Program Tracking Sheet</b> | <p><b>5. Delete fields pertaining to individual measure savings for which energy savings are included in the EnerGuide rating:</b> Currently, each measure has an associated field indicating the related annual energy savings. After analyzing HOT2000 simulations, only four of these measures did not seem to affect the EnerGuide rating. Consequently, the energy savings associated with these measures should be presented in separate columns. These measures are as follows: programmable electronic thermostats, electric water heater pipe wraps, drain water heat recovery (DWHR) with an efficiency below 42 percent and DWHR with an efficiency above 42 percent. The Evaluator suggests removing the fields that are not necessary to calculate energy savings including the “estimated kWh savings for individual measures” column to facilitate understanding of the tracking sheet.</p> <p><b>6. Add the period or end date of the renovation:</b> During the program impact evaluation process, the Evaluator made an adjustment to HOT2000 simulation outputs as a result of a billing calibration on a sample of projects. For future program evaluations, it would be beneficial to add the renovation completion date of each project in the tracking sheet since this information is very important when conducting a billing calibration. As mentioned earlier in this report, Econoler recommends that ENSC conduct a more thorough billing analysis to evaluate the overestimation of the simulated household consumption after the implementation of energy efficiency measures, which would then allow for the comparison with the overestimation calculated prior to the implementation of energy efficiency measures. The end date of the renovation would be very useful when performing such analysis.</p> <p><b>7. Add the type of project:</b> Two kinds of projects are included in this program: existing houses and small multi-unit residential buildings (MURB). The PM ought to include this information in the tracking sheet to follow program development for each project type.</p> |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>Program Tracking Sheet</b>            | <p><b>8. Create fields for building energy consumption data:</b> Currently, the energy savings are calculated using the EnerGuide rating. It would be suitable and more accurate to calculate them with the energy consumption data of HOT2000. Econoler proposes adding fields for building energy consumption per year in kWh for D and E audits.</p> <p><b>9. Ensure that all fields are systematically filled in:</b> Once the necessary fields are identified, it is recommended there be a process to ensure they are systematically filled in. A protocol could be implemented to ensure that all information is collected and entered in the tracking sheet. Even if the percentage of missing entries for the EnerGuide rating is quite low for 2011 (only 3%), the Evaluator cannot provide ENSC with gross energy savings for these projects.</p>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Program Design and Implementation</b> | <p><b>10. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will ensure that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> <p><b>11. Strengthen the partnership with the DAs:</b> In 2011, ENSC enhanced the involvement of DAs in the program process. Nevertheless, interviews with DAs suggested that there are still room for improvement in this matter. During these interviews, the DAs proposed, among other things, that they could be notified in advance of any major modifications to the program or could be consulted about potential EE measures to be included in the program.</p> |

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| <b>Program Design and Implementation</b> | <p><b>12. Create a list of pre-approved contractors:</b> During the in-depth interviews, some of the program partners mentioned the contractors' low understanding of energy efficiency programs in general. The lack of experienced contractors to implement the measures is an important barrier to implementation. Training contractors and establishing a list of pre-approved contractors should be part of the program components to reduce complaints and achieve the forecast program savings more successfully.</p>                                                                                                                                                                                                                                                                                            |
|                                          | <p><b>13. Inform the participants about the expected savings of their projects:</b> One of the program barriers is that measures are too expensive to implement. Participants look at the up-front capital without realizing that the savings are present for the useful life of the measure. Savings calculations based on the duration of the measure (and not only the simple payback period) may be incorporated in the report and explained to participants as an educational component so that they can appreciate the true value of the savings. ENSC could also analyze the potential for developing an on-bill financing scheme for residential customers. This could help overcome the financial barrier related to the implementation of certain costly energy efficiency measures at residential level.</p> |
| <b>ENSC Website</b>                      | <p><b>14. Facilitate the understanding of the participation process by clarifying the difference between steps 3 and 4:</b> In the "Enroll in the Program" section found on the website (MURB component) as well as in the "How to Take Part" section of the Rebate Guide, the difference between steps 3 and 4 is not clear. Both steps take place when the assessment after retrofit has been completed. These sections could be revised for better understanding.</p>                                                                                                                                                                                                                                                                                                                                                |
|                                          | <p><b>15. Provide examples:</b> In the "Enroll in the Program" section found on the website (MURB component), there are multiple rebates for different situations and it is not easy to assimilate. For instance, at the end of that section, it could be useful to simplify the description of how the rebate works, especially for step 5.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                          | <p><b>16. Clarify the maximum rebate amount:</b> A maximum rebate amount of \$6,000 per home is mentioned in the Rebate Guide found on the website. The program manual indicates that "the homeowner can only receive a rebate up to the maximum funding available which is \$1,500 provincial per house, and \$5,000 in federal rebates." The program manual also indicates that there is no maximum rebate amount per house for electricity DSM. This information could be confusing and misleading and should be clarified in the program literature, including the website.</p>                                                                                                                                                                                                                                     |

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <b>On-Site Visits</b> | <p><b>17. Explain in detail the protocol to the clients:</b> The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations, etc.). Participants may have difficulties understanding a number of these concepts.</p>                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | <p><b>18. Document house parameters:</b> The architectural elements of the houses (building faces, foundation and roof) should be photographed in order to keep a record and create more precise HOT2000 models. This is especially true when the simulations are made at a certain time upon completion of the site visit. This practice also allows for the verification of simulation data entries by a third party who has not been on site.</p>                                                                                                                                                                                                                                                                                                          |
|                       | <p><b>19. Enforce the protocol procedures for performing blower door tests:</b> In light of the on-site visits conducted, the Evaluator identified two relevant mistakes in conducting the blower door tests, namely advisors did not block the blower door opening during the initial test and failed to take the temperature on site during the visit. These practices may influence significantly the HOT2000 simulation and, therefore, the calculated EnerGuide rating.</p>                                                                                                                                                                                                                                                                              |
|                       | <p><b>20. Promote the addition of typical technical details on audit reports:</b> Typical energy reports that are automatically generated by HOT2000 contain a low level of technical details on the proposed energy efficiency measures and on how to implement them. In addition, some concerns may be important to mention in energy reports, such as the installation of an air exchanger in an old house whose air infiltrations would decrease significantly with the improvement of the building envelope. With this in mind, Econoler believes that ENSC should promote the addition of technical information and safety concerns (if any) on the audit reports to help participants understand and follow up on their energy efficiency project.</p> |
|                       | <p><b>21. Encourage the energy advisor to provide participants with booklets:</b> Under its ecoENERGY program, NRCan developed a series of booklets for home owners. The booklets aim at explaining energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide "Keeping the Heat In"). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants agreeing with the recommendations of the audit report.</p>                                                                                                                                                                             |



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|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Relationship with Partners</b> | <p><b>22. Maintain marketing efforts to show program continuation:</b> The marketing and outreach activities are rather negatively perceived by the program partners. According to them, the program needs consistent marketing and promotion regardless of the involvement of the Federal Government. Further marketing initiatives will be required in order to be proactive in educating Nova Scotians about the fact that ENSC and the Province are committed to the program regardless of federal support.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Participant Perspectives</b>   | <p><b>23. Provide more information to participants on the recommended measures and on the expected savings of their projects based on the duration of the measure:</b> Since the main reason cited by participants for not having implemented some measures recommended by the EEH program is that measures are too expensive, the Evaluator suggests informing the participants about the expected savings of their projects based on the duration of the measure. This could be included in the pre-retrofit report with a view to reducing the perceived cost barrier. Furthermore, 14 percent of the respondents who suggested program improvements proposed offering more information on the measures recommended while 3 percent mentioned that improving communication in general would be appreciated. With respect to respondents who suggested offering more information on the measures recommended, several mentioned that the distinction between eligible measures and the measures not covered by the program could be made clearer.</p> |
| <b>Impact Evaluation</b>          | <p><b>24. Collect the building energy consumption data for each house:</b> The Evaluator recommends calculating the energy savings of each participant using the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.</p>                                                                                                                                                                                                                                                                                                                                                                  |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Impact Evaluation | <p><b>25. Conduct a more thorough billing analysis to evaluate the overestimation of energy consumption by HOT2000 with better precision:</b> The billing calibration developed in the 2011 evaluation revealed that HOT2000 tends to overestimate the house energy consumption. In the future, the Evaluator proposes developing a more comprehensive billing analysis to calculate an adjustment factor with a higher accuracy level. Using all participants from 2009, 2010 and 2011, a billing analysis could compare one full year of pre- and post-implementation energy consumption data with a view to establishing an adjustment ratio by comparing the HOT2000 expected savings to the actual reduction in participants' energy bills.</p> |
|                   | <p><b>26. Revise HOT2000 models on a random basis:</b> The Evaluator or the PM should revise a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.</p>                                                                                                                                                 |

## APPENDIX II – PROGRAM THEORY

The following table explains the relationship between the different levels of the logic model.

| <b>EnerGuide for Existing Houses and Multi-Units Houses</b> |                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                   |                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                      |
| #                                                           | Program Theory                                                                                                                                                                                                                                                     | Performance Indicators                                                                                                                                                                                                                                                               |
| 1                                                           | National Resources Canada (NRCan) has to select delivering agencies to make sure that the program protocol is adequately applied for quality control purposes. Once the agency is selected, it signs a delivery agreement with NRCan.                              | List of approved agencies in the Province                                                                                                                                                                                                                                            |
| 2                                                           | The delivery agency has to train its energy auditors to use the simulation software HOT2000 and other aspects of the energy audit such as the blower door test, etc.                                                                                               | Record of training sessions along with places, names of trainees, dates and evaluation forms.                                                                                                                                                                                        |
| 3                                                           | The Program Manager (PM) has a series of activities to attract participants to subscribe to the program even though there is a small fee to have the first audit completed.                                                                                        | Publicity and marketing outreach, presence in events and all other marketing activities have to be recorded along with the time and place to enable the PM to establish which medium or marketing strategy has provided the most participants and which one has provided the fewest. |
| 4                                                           | Participants receive a pre-retrofit report identifying energy efficiency (EE) measures and their cost-effectiveness. In addition, if participants have an electric water heater, the delivery agent (DA) installs an insulating water tank blanket and pipe wraps. | Standard audit report as prescribed by NRCan with nominal information and authorization for other organizations to make further contact.                                                                                                                                             |
| 5                                                           | With the EE measures identified and their cost-effectiveness, the participant has all the information required to make an informed decision.                                                                                                                       | This information is listed in the pre-retrofit report mentioned in item #4.                                                                                                                                                                                                          |

| <b>EnerGuide for Existing Houses and Multi-Units Houses</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                             |
| #                                                           | Program Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Performance Indicators                                                                                                                                                                                                                                      |
| 6                                                           | Once the decision is made, participants can implement themselves, or through a building contractor, all or some of the measures recommended in the audit, knowing that there will be incentives to cover some of these measures from different sources.                                                                                                                                                                                                                                                                                                                                                                     | Compilation of the list of measures each participant has implemented along with their deemed savings.                                                                                                                                                       |
| 7                                                           | Depending on the nature of the measures, participants have access to three organizations that could offer incentives depending on the nature of the measure. ENSC provides incentives for specific equipment related to electric space and water heating. The provincial government provides incentives for envelope measures while NRCan provides an incentive for a pre-approved set of measures. NRCan is responsible for its own activities while ENSC acts as a single window for electricity savings measures as well as other energy-saving measures. The first is funded by ratepayers and the second by taxpayers. | Track record of payments for electricity measures paid by ratepayers.<br>Track record of payments for other sources of energy savings paid by taxpayers.<br>Track record of EnerGuide audit number to cross-check multiple incentives for the same measure. |
| 8                                                           | Implementing the EE measure will reduce the energy bill.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Each measure has its own deemed savings along with the source or calculations for these savings. Double counting should be monitored.                                                                                                                       |
| 9                                                           | Eventually, the growing number of participants will result in an increased confidence in the merits of EE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Participant statistics or the annual market penetration rate could be used as a performance indicator for this program.                                                                                                                                     |
| 10                                                          | Contractors that specialized in implementing EE measures will increase so that access to energy efficiency measures will be wider for market transformation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Keeping statistics on specialized contractors could be a proper indicator if they are registered with the program.                                                                                                                                          |

| <b>EnerGuide for Existing Houses and Multi-Units Houses</b> |                                                                                                                                                                       |                                                                                                                     |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                   |                                                                                                                                                                       |                                                                                                                     |
| #                                                           | Program Theory                                                                                                                                                        | Performance Indicators                                                                                              |
| 11                                                          | Sustainable energy savings will occur in the long run resulting in a reduction in harmful emissions and in avoiding building new energy plants fueled by oil or coal. | The more houses go through this process, the more harmful emissions coming from thermal generation will be reduced. |

## APPENDIX III – DEMOGRAPHICS

Most respondents reside in single-family detached homes (94%) with at least three bedrooms (92%). All respondents reside in their home year round (100%).

**Table 35: Type of Residence**

| Type of Residence                      | 2009 | 2010 | 2011 |
|----------------------------------------|------|------|------|
| <i>Sample Size</i>                     | 23   | 70   | 70   |
| Single-family detached                 | 100% | 93%  | 94%  |
| Semi-detached                          | --   | 6    | 3    |
| Townhouse or duplex                    | --   | --   | 1    |
| Apartment with more than five stories  | --   | --   | 1    |
| Row house                              | --   | 1    | --   |
| Apartment with fewer than five stories | --   | --   | --   |
| Mobile home or house trailer           | --   | --   | --   |

**Table 36: Number of Bedrooms**

| Numbers of Bedrooms | 2009 | 2010 | 2011 |
|---------------------|------|------|------|
| <i>Sample Size</i>  | 23   | 70   | 70   |
| 1                   | 0%   | 0%   | 0%   |
| 2                   | 17   | 7    | 9    |
| 3                   | 52   | 53   | 59   |
| 4 or more           | 30   | 40   | 33   |

Just under three in 10 (27%) participants have four or more people residing in their household, while over four in 10 (44%) have two people residing in their household.

**Table 37: Number of Full Time Residents**

| Full Time Residents | 2009 | 2010 | 2011 |
|---------------------|------|------|------|
| <i>Sample Size</i>  | 23   | 70   | 70   |
| 1                   | 4%   | 7%   | 13%  |
| 2                   | 44   | 51   | 44   |
| 3                   | 30   | 21   | 16   |
| 4                   | 22   | 11   | 17   |
| 5 or more           | --   | 9    | 10   |
| Average             | 2.7  | 2.6  | 2.7  |

In terms of income, just over one-half of respondents have a household income of \$70,000 or more (54%).

**Table 38: Annual Income**

|                      | 2009 | 2010 | 2011 |
|----------------------|------|------|------|
| <i>Sample Size</i>   | 23   | 70   | 70   |
| Less than \$15,000   | 0%   | 0%   | 0%   |
| \$15,000 to \$24,999 | 4    | 3    | 1    |
| \$25,000 to \$34,999 | 4    | 11   | 9    |
| \$35,000 to \$49,999 | 17   | 13   | 14   |
| \$50,000 to \$69,999 | 13   | 19   | 11   |
| \$70,000 to \$79,999 | 9    | 6    | 13   |
| \$80,000 or more     | 52   | 36   | 41   |
| Refused              | --   | 13   | 10   |

One-half of respondents are aged 45 to 64 (52%), and just under two in 10 are 65 years of age or older (17%).

**Table 39: Respondent Age**

| <b>Respondent Age</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------|-------------|-------------|-------------|
| <i>Sample Size</i>    | 23          | 70          | 70          |
| 18 to 24              | 4%          | 0%          | 1%          |
| 25 to 34              | 17          | 19          | 7           |
| 35 to 44              | 9           | 16          | 23          |
| 45 to 54              | 39          | 20          | 26          |
| 55 to 64              | 30          | 34          | 26          |
| 65 or older           | --          | 11          | 17          |

Seven in 10 respondents have a college or university degree (71%).

**Table 40: Education**

| <b>Education</b>      | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------|-------------|-------------|-------------|
| <i>Sample Size</i>    | 23          | 70          | 70          |
| Less than high school | 0%          | 6%          | 1%          |
| High school graduate  | 13          | 19          | 19          |
| Trade certificate     | 0           | 7           | 3           |
| College diploma       | 17          | 10          | 17          |
| University diploma    | 70          | 59          | 54          |
| Other                 | --          | --          | 3           |
| Don't know            | --          | --          | 3           |

Respondents are evenly divided between males and females, with 53 percent of respondents who are male, and 47 percent who are female.

**Table 41: Gender**

|                    | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------|-------------|-------------|-------------|
| <i>Sample Size</i> | 23          | 70          | 70          |
| Male               | 52%         | 66%         | 53%         |
| Female             | 48          | 34          | 47          |



## **APPENDIX IV – INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: EnerGuide for Existing Houses & Multi-Units**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: Evaluation report 2010</b> |
|---------------------------------------|

#### **Page 15**

Q: What is the status with NRCan with this program for 2010? We know that they were in and out and that has created some confusion in the market.

#### **Page II**

C: The justification and the potential are quite clear in this page.

#### **Page III**

EEH-R1 : What is the status of this recommendation?

EEH-R5: What is the status of this recommendation?

EEH-R6 : What is the status of this recommendation?

EEH-R20: The recommendation is based on 3 respondents. Any comment?

#### **Page V**

EEh-R11: What is the status for this recommendation?

EEh-R14 : What is the status of this recommendation?

EEH-F15 : How do you explain that savings in existing houses for thermostat are lower in existing houses (where the potential is higher) than the new houses (better built and less potential)?

EEH-F 16 : What is the status for this finding?

**Page 1**

C: As I understand it, there are 3 sources of incentives. (NRCan, ENSC and the Provincial Government. This is somewhat difficult to track?

**Page 2**

Q: Multi-unit residential buildings were already included in the 2010 version of the program, so it's not an addition to 2010?

**Page 3**

C: It seems, after first analysis that there are too many organizations and too many incentives involved in that program and double standards for electric houses or other energy sources houses. Care to comment on the difficulty you may have to manage such a program?

C: There are consistent rumors that HOT 2000 overestimate consumption and savings. Care to comment on that?

|                                         |
|-----------------------------------------|
| <b>Source: Web Site Existing Houses</b> |
|-----------------------------------------|

Rebate Guide Section

Q: On what basis are the rebates calculated?

Q: When you indicate financing is available; there is no information about that in the rebate guide. What kind of financing are you offering?

|                                                          |
|----------------------------------------------------------|
| <b>Source: Web Site Multi-Unit Residential Buildings</b> |
|----------------------------------------------------------|

Brochure: No questions

WEB-Site (MURBs)

Overview

Q: It does not specify that it's for landlords

C: The sentence “Once the efficiency upgrades have been added, you have 18 months to complete your upgrades ...” is strange?

Q: How are the savings calculated by measures or by rating increase?

C: In the Enroll in the Program section, Step five (maximum building envelope rebate and the section about the multiplier) is difficult to understand but is well explained in the program manual.

C: A process flow chart could help the participant in his involvement, especially that there are so many organization and so many incentives coming from different parties.

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

## **Page 2**

Q: There are definitively too many sources of incentives, maximums amounts, envelop measures, prescriptive measures and also too many organizations to manage this program adequately. Care to comment?

- > Incentive from ENSC
- > Incentive From NRCan
- > Incentive from the Province
- > Incentive for rating increase
- > Incentive for envelop measure
- > Incentive for prescriptive measures
- > Incentive for audits

Q: How are the savings for prescriptive electricity measures calculated and what are their sources?

## **Page 4**

Who trains the auditors, the delivery agents or NRCan?

C: There are no definitions for the different kinds of audits (D,E,F, etc.)

Q: With all these incentives is there a possibility that for one particular measure there is more than one source of incentive? For example if by installing a measure the rating is increased and they get an incentive for rate increase but also get another incentive for the measure itself? It might not be the case, but it's unclear.

Q: Does ENSC manage the funds coming from the Province?

Q: Does ENSC manage NRCan funds?

The logic model

We proposed a modification for the logic model to include other parties beside ENSC. We sent the modification to the PM for comments.

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Please indicate who are the program partners, how many are they, in this program and what are their roles in order to help us asking the proper questions for process evaluation.

Q: When setting the objectives for gross savings for the program, were there any assumptions for distortion effects such as free-riders and spillover?

Q: What are the program barriers?

Q: Do you calculate cost-effectiveness test post evaluation?

Q: When the program was initially designed was there any evaluation plan designed at the same time?

Q: Does the program have a written marketing strategy and if yes, do you collect performance indicators to monitor the marketing activities?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database? (1 is very difficult 10 is very easy)

Q: Do you have any other subject you wish us to investigate with the program partners who will be part of the process evaluation?

Thank you very much for your time and cooperation.

## **APPENDIX V – INTERVIEW GUIDE WITH DELIVERY AGENTS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: EnerGuide for Existing Houses & Multi-Units**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the EnerGuide for Existing Houses & Multi-Units Program**

**Q9 – We would like your opinion on the number of parties involved in this program**

**Q9a- Other program partners like you (auditors and contractors). Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a1- If you answered Too Few or Too Many, please comment:**

**Q9b - We would like your opinion on the number of organizations other than ENSC involved in the program (NRCan, Province of Nova Scotia). Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion



**Q9b1- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners in this program (specify which ones)?**

**Auditors**

**Score:**

**Contractors**

**Score:**

**Q10a – If any of your answers to Q10 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participants?**

**Q12- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

**Other program partners**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Other organizations involved in the program**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Participants**

☐ Yes

What was the confusion about?

☐ No

☐ Don't know

**Q13- What is your opinion in regard to the program name that has changed since its first implementation (EnerGuide for Existing Houses Program and now the actual name)?**

**Q14- What is your opinion in regard to program on-course modifications other than the name change (e.g., the extension to Multi-Units)?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

**Q15- What is your opinion about the fact that ENSC now acts as a single window to finance the rebates for electricity-saving measures as well as for other energy-saving measures?**

☐ It simplifies the participation process for the delivery agent

☐ It simplifies the implementation process for the participant

☐ It does not change anything

☐ It complicates the participation process

☐ No opinion

**Comment:**

**Q16- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q16a- What was the complaint about?**

**Q17 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX VI – INTERVIEW GUIDE WITH ENERGY AUDITORS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: EnerGuide for Existing Houses & Multi-Units**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

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Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the EnerGuide for Existing Houses & Multi-Units Program**

**Q9 – We would like your opinion on the number of parties involved in this program.**

**Q9a- Other program partners like you (delivery agents and contractors). Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a1- If you answered Too Few or Too Many, please comment:**

**Q9b - We would like your opinion on the number of organizations other than ENSC involved in the program (NRCan, Province of Nova Scotia, ENSC). Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9b1- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners in this program (specify which ones)?**

**Delivery Agents**

**Score:**

**Contractors**

**Score:**

**Q10a – If any of your answers to Q10 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participants?**

**Q12- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

**Other program partners**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

☐ Not applicable



**Other organizations involved in the program**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Participants**

☐ Yes

What was the confusion about?

☐ No

☐ Don't know

☐ Not applicable

**Q13- What is your opinion in regard to the program name that has changed since its first implementation (EnerGuide for Existing Houses Program and now the actual name)?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of name (e.g., the extension to Multi-Units, etc.)?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

**Q15- What is your opinion about the fact that ENSC now acts as a single window to finance the rebates for electricity-saving measures as well as for other energy-saving measures?**

☐ It simplifies the participation process for the delivery agent

☐ It simplifies the implementation process for the participant

☐ It does not change anything

☐ It complicates the participation process

☐ No opinion

**Comment:**

**Q16- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q16a- What was the complaint about?**

**Q17 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

**Q18 – On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your training as an energy auditor directly or indirectly from NRCan?**

**Q18a – If your answer to Q18 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q19 – On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate the performance or accuracy of the HOT 2000 software that you are using to perform your audit?**

**Q19a – If your answer to Q18 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

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## **APPENDIX VII – PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

#### **NSPI – EnerGuide for Existing Houses Program**

**October 25, 2011**

Hello may I please speak with [INSERT NAME]?

- 1 Yes [GOTO INTRODUCTION]
- 2 No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

### **INTRODUCTION**

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your household recently participated in Efficiency Nova Scotia Corporation’s EnerGuide for Existing Houses Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

### **SECTION V - VERIFICATION AND RECALL**

V1. We understand you participated in the EnerGuide for Existing Houses Program. Is that correct?

- 1 Yes [CONTINUE]
- 2 No [PROMPT: “Are you sure? Someone would have come to your house to evaluate the energy efficiency of your home and sent you a report telling you about upgrades you could make to your home to improve its energy efficiency. They might have talked about the possibility of you getting rebates to cover some of the cost of these upgrades.” RECODE AS “YES” IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS NO: “Is there someone else in the household who would know about having participated in the EnerGuide for Existing Houses program?”]

\_\_\_Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

\_\_\_No [THANK & TERMINATE]

98. Don't know [PROMPT IF NOT ALREADY READ TO RESPONDENT: "Someone would have come to your house to evaluate the energy efficiency of your home and sent you a report telling you about upgrades you could make to your home to improve its energy efficiency. They might have talked about the possibility of you getting rebates to cover some of the cost of these upgrades." RECODE AS "YES" IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS DON'T KNOW: "Is there someone else in the household who would know about having participated in the EnerGuide for Existing Houses program?"]

1. \_\_\_Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

2. \_\_\_No [THANK & TERMINATE]

99. Refused [THANK AND TERMINATE]

[IF REFUSED, ASK "Can we schedule a more convenient time for you to conduct this survey?"]

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

## **SECTION P - PROGRAM NOTORIETY AND REASONS FOR PARTICIPATING**

- P1. How did you learn about the EnerGuide for Existing Houses program? [DO NOT READ. ACCEPT MULTIPLE RESPONSES]

1. (Nova Scotia Power Bill insert)
2. (Efficiency Nova Scotia Website)
3. (Conserve Nova Scotia Website)
4. (Natural Resources Canada Website)
5. (The Internet)
6. (Efficiency Nova Scotia on-hold message)
7. (Radio Ad)
8. (Newspaper Ad or Story)
9. (Program Delivery Agent--[Name of DA-6] - ACAP Cape Breton)
10. (Program Delivery Agent: [Name of DA-5] - Amerispec Home Inspection Services)
11. (Program Delivery Agent--[Name of DA-4] - Clean Nova Scotia)
12. (Program Delivery Agent: [Name of DA-3] - Ridge Energy)
13. (Program Delivery Agent:[Name of DA-2] - Sustainable Housing & Education Consultants)

- 14. (Program Delivery Agent: [Name of DA-1] - Trinity Inspection Services)
- 15. (From a contractor)
- 16. (Word of mouth -- neighbour, friend, co-worker, family member, etc.)
- 96. (Other) [SPECIFY \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

P2. Now I'm going to ask you to think back to when you decided to schedule an energy efficiency evaluation and participate in the EnerGuide for Existing Houses program. What was the SINGLE most important reason you were interested in having your home evaluated by an EnerGuide Energy Advisor? **(DO NOT READ – accept one response)**

- 1. (To save on energy costs/bills)
- 2. (I was thinking about/planning to get energy efficient upgrades anyway)
- 3. (To find out how energy efficient my home was/to get my home evaluated)
- 4. (To get expert's advice about what upgrades to get/how to make home more energy efficient)
- 5. (To save energy—not further specified whether for cost, environment)
- 6. (To help the environment)
- 96. (Other) [SPECIFY \_\_\_\_\_])
- 98. (Don't know) GO TO P4
- 99. (Refused) GO TO P4

P3. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE RESPONSES] [SAME LIST AS IN P2 ABOVE]

P4. Before participating, did you have any concerns about taking part in the program?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

P5. [IF P4 = 1] What were those concerns? PROBE: Anything else? [DO NOT READ. ACCEPT ALL RESPONSES]

- 1. (That my home would be very inefficient)
- 2. (That improvements would cost a lot)
- 3. (Rebates would be too low / insufficient)
- 4. (That the audit wouldn't find anything / my home was too efficient)

- 5. (Wouldn't like what they recommended)
- 6. (Wouldn't like what I installed)
- 7. (The process would take too long)
- 96. (Other) [SPECIFY \_\_\_\_\_]
- 98. Don't know
- 99. Refused

## **SECTION S - SATISFACTION WITH PROGRAM**

S1. Thinking of your OVERALL experience with the EnerGuide for Existing Houses Program up to this point, including any services received or energy efficient upgrades installed, how satisfied are you overall with the program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied? CODE ONE ONLY

- 1. Very satisfied
- 2. Satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Dissatisfied
- 5. Very Dissatisfied
- 98. (Don't know)
- 99. (Refused)

S2. [IF S1 = 4 or 5] You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were not satisfied with the program overall? [PROBE FOR SPECIFIC REASON. ACCEPT ONE RESPONSE] DO NOT READ

- 1. (The first or final energy audit took too long)
- 2. (It was difficult or long to schedule an appointment with the evaluator)
- 3. (The cost of the evaluation was too high)
- 4. (The rebate received was too small)
- 5. (I did not agree with the recommendations that were made)
- 6. (I found the energy evaluator to be unpleasant)
- 7. (I did not get the final EnerGuide rating I was expecting)
- 96. (The time period given to complete the upgrades is too short)
- 97. (Other) [SPECIFY \_\_\_\_\_]
- 98. (Don't know) GO TO S4
- 99. (Refused) GO TO S4

S3. Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASON.ACCEPT MULTIPLE RESPONSES][SAME LIST AS S2 ABOVE] DO NOT READ

- S4. Now I'm going to ask you about your experience with specific aspects of the EnerGuide for Existing Houses Program. For each one, please tell me if you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied with your experience with that specific aspect of the program. **DO NOT RANDOMIZE - CODE ONE ONLY PER ASPECT**

|                                                                                                                                                         | Very satisfied | Satisfied | Neither<br>satisfied nor<br>dissatisfied | Dissatisfied | Very<br>dissatisfied | DK/Ref |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|------------------------------------------|--------------|----------------------|--------|
| a. The First Energy Audit Overall (This was the first audit of your home's energy use that identified ways to make it more energy efficient)            | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| b. Scheduling and timing of the first audit                                                                                                             | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| c. Courteousness of Energy Advisor                                                                                                                      | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| d. Information provided by Energy Advisor                                                                                                               | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| e. The report you received about your home's current energy use and recommendations for energy efficient upgrades                                       | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| f. The Final Energy Audit Overall (This was the final audit of your home's energy use to confirm the energy efficient upgrades that you had installed.) | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| g. Scheduling and timing of the final audit                                                                                                             | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| h. The rebates provided by the program overall                                                                                                          | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| i. The rebates provided by the program for electric space and water heating measures                                                                    | 1              | 2         | 3                                        | 4            | 5                    | 98/99  |
| j. The energy efficiency upgrades installed in your home?                                                                                               |                |           |                                          |              |                      |        |



- S5. [IF S4a = 4 or 5 and/or S4f=4 or 5] You indicated that you were not satisfied with the first and/or final energy audit that was done of your home. What was the SINGLE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]
1. (The energy audit took too long)
  2. (I did not agree with the recommendations that were made)
  3. (I found the energy evaluator to be unpleasant)
  4. (I did not get the final EnerGuide rating I was expecting)
  96. (Other) [SPECIFY \_\_\_\_\_]
  98. (Don't know) GO TO VR1
  99. (Refused) GO TO VR1
- S6. [IF S4a = 4 or 5 and/or S4f=4 or 5] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE] [SAME LIST AS S5 ABOVE]

## **SECTION VR - VERIFICATION OF ACTIONS TAKEN**

- VR1. I am going to read you a list of upgrades that may have been recommended by the Energy Advisor for your home. For each one, can you please tell me if that upgrade was recommended for your home? DO NOT ROTATE - CODE ONE ONLY PER STATEMENT
- [1 = YES, RECOMMENDED, 2 = NO, NOT RECOMMENDED, 98 = DON'T KNOW / DON'T REMEMBER, 99 = REFUSED] READ
- a. High efficiency air to air (or air source) heat pump with electric backup
  - b. High efficiency air to air (or air source) heat pump with NON electric backup
  - c. High efficiency ground source (or geothermal) heat pump
  - d. Electric Thermal Storage (ETS) room units
  - e. Electric Thermal Storage (ETS) hot air furnace
  - f. Electric Thermal Storage (ETS) central hydronic system
  - g. Electronic programmable thermostats
  - h. Drain water heat recovery
  - i. Solar domestic water heating system
  - j. High efficiency ductless mini split heat pump
  - k. Electric water heater tank insulation
  - l. Electric water heater exposed pipe insulation

[ASK VR2a-b IF ANY ITEM IN VR1a thru I=1 ("Yes, recommended")]

VR2a. IF **MORE THAN ONE** ITEM IN VR1a-I=YES, READ: Through the program, have you implemented at least one, all or none of the energy efficiency recommendations, meaning that you received a rebate or incentive for installing the upgrades? Have you... [READ. ACCEPT ONE RESPONSE]

1. Implemented at least one upgrade
2. Implemented all the upgrades
3. Or Not implemented any upgrades
98. (Don't know)
99. (Refused)

VR2b. IF ONLY **ONE** ITEM IN VR1a-I=YES, READ: Through the program, have you implemented this energy efficiency recommendation, meaning that you received a rebate or incentive for installing the upgrade? Have you... [READ. ACCEPT ONE RESPONSE]

1. Yes, Implemented the upgrade
2. No, Not implemented the upgrade
98. (Don't know)
99. (Refused)

**[ASK VR3 IF VR2a=1 ("Yes, implemented at least one upgrade")]**

VR3. Which of the following recommendations have you implemented under the program? [ASK FOR EACH ITEM IN VR1a thru I = 1]

[1 = YES, IMPLEMENTED, 2 = NO, NOT IMPLEMENTED, 98 = DON'T KNOW / DON'T REMEMBER, 99 = REFUSED] READ

- a. High efficiency air to air (or air source) heat pump with electric backup
- b. High efficiency air to air (or air source) heat pump with NON electric backup
- c. High efficiency ground source (or geothermal) heat pump
- d. Electric Thermal Storage (ETS) room units
- e. Electric Thermal Storage (ETS) hot air furnace
- f. Electric Thermal Storage (ETS) central hydronic system
- g. Electronic programmable thermostats
- h. Drain water heat recovery
- i. Solar domestic water heating system

- j. High efficiency ductless mini split heat pump
- k. Electric water heater tank insulation
- l. Electric water heater exposed pipe insulation

## **SECTION SO – SPILLOVER**

**SKIP PATTERN APPLIES TO ENTIRE SO SECTION: ASK IF VR2a=3 (“No, have not implemented any upgrades” OR IF VR2b=2 (“No, not implemented the upgrade”) OR IF ANY POSED ITEM IN VR3a thru l=2 “No, not implemented”)**

You mentioned in a previous answer that there were some recommended upgrades that you decided not to install through the program.

SO1. **Since the time that you participated** in the EnerGuide for Existing Houses Program, have you implemented one or more of the recommended upgrades on your own?

- 1. (Yes)
- 2. (No)
- 98. (Don’t know)
- 99. (Refused)

**[IF SO1=1]**

SO2. Which upgrades have you implemented on your own after participating in the EnerGuide for Existing Houses Program? [READ, ACCEPT MULTIPLE]

IF VR2a=1 (Yes, implemented at least one upgrade) : LIST OF EACH ITEM IN VR1a thru l=1 (“Yes, recommended”) AND VR3a thru l=2 (“No, not implemented”)

OR

IF VR2a=3 (No, have not implemented any upgrades): LIST OF EACH ITEM IN VR1a thru l=1 (“Yes, recommended”)

OR

IF VR2b=2 (No, not implemented the upgrade): LIST OF ITEM IN VR1a thru l=1 (“Yes, recommended”)

- 96. Other energy-efficient measures? [Please specify\_\_\_\_\_]
- 98. (Don’t know)
- 99. (Refused)

**[IF SO1=1]**

SO3. Have the energy efficiency upgrades you implemented outside of the EnerGuide for Existing Houses Program received financing or rebates from other *Efficiency Nova Scotia* programs?

1. Yes [Go to NP1]
2. No
98. (Don't know) [Go to NP1]
99. (Refused) [Go to NP1]

**[IF SO3 = 2]**

SO4. How influential was your experience with the Program on your decision to implement some or all of the measures that you installed on your own after participating in the EnerGuide for Existing Houses program? Please give your answer on a scale of 0 to 10, where 0 indicates that the EnerGuide for Existing Houses program "had no influence at all on your decision to implement additional energy efficiency upgrades" and 10 indicates that the program was "extremely influential in your decision to implement additional energy efficiency upgrades."  
**[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

## **REASONS FOR NON-PARTICIPATION [NP SERIES]**

**[ASK IF VR2a=1 or 3 OR IF VR2b=2]**

NP1. You mentioned in a previous answer that there were some recommended upgrades that you decided not to install. What is the SINGLE most important reason you decided not to install these recommended upgrades through the program? [PROBE FOR SPECIFIC REASONS; ACCEPT ONE] DO NOT READ

1. (Too busy)
2. (Too expensive)
3. (Don't have the cash needed)
4. (Payback too long)
5. (Don't think I really need it)
6. (Rebate not big enough)
7. (Want to install other upgrades that aren't covered)
8. (Plan to install in the future)

- 96. (Other: [SPECIFY: \_\_\_\_\_])
- 98. (Don't know) GO TO FR1
- 99. (Refused) GO TO FR1

**[ASK IF VR2=1 or 3]**

NP2. Are there any other reasons you decided not to install these recommended measures in your home through the program? [PROBE FOR SPECIFIC REASONS; MULTIPLE RESPONSE; SAME LIST AS SM1 ABOVE] DO NOT READ

**[ASK ALL]**

**FREE-RIDERSHIP [FR SERIES]**

In addition to the recommended measures which we have just discussed, the program could have implemented other energy-efficient upgrades to your home. Now I'm going to ask you to think of all the energy-efficient upgrades that were implemented to your home under the program.

- FR1. **BEFORE participating** in the EnerGuide for Existing Houses Program, did you have plans to implement the specific energy-efficient upgrades that were implemented through the Program?
- 1. Yes
  - 2. No
  - 98. (Don't know)
  - 99. (Refused)

**[IF FR1=YES]**

- FR1a. I just want to make sure I understand - **Before** you decided to participate in the EnerGuide for Existing Houses Program, you had already made the decision to implement the energy efficiency upgrades you implemented through the program?
- 1. Yes
  - 2. No
  - 98. (Don't know)
  - 99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide for Existing Houses program.

If you had not participated in the EnerGuide for Existing Houses program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT, In the absence of the Program, would you have . . . : DO NOT ACCEPT A RANGE – ASK FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. ...implemented exactly the same energy efficiency upgrades that you implemented through the program?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2b. ...implemented standard equipment instead of energy-efficient equipment?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2c. ...implemented the exactly same energy efficiency upgrades that you implemented through the program, *but at a later date*?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT ASK FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your response to a previous question that if the EnerGuide for Existing Houses program had not been available there was an X in 10 likelihood that you would have implemented the exactly same upgrades with the same energy-efficient upgrades that you implemented through the program, *but at a later date*. Approximately how many months later would you have implemented these upgrades? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't Know)
99. (Refused)

---

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within...

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3. Efficiency Nova Scotia gave you a rebate for the energy efficiency upgrades you implemented in your home. If you had not received the rebate from Efficiency Nova Scotia, would you have paid for the full cost of the energy efficiency upgrades you implemented? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely **Would Not** Have Paid" and a 10 indicating that you "Definitely **Would Have** Paid." PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR4. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to implement the energy efficiency upgrades you implemented through the program? Using a scale from 0 to 10 where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to implement the energy efficiency upgrades you implemented through the Program. DO NOT ACCEPT A RANGE

| Factor<br>(READ AND RANDOMIZE)                                                                                                                      | Responses                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| a. The program incentive                                                                                                                            | ___ Response ___98 Don't Know ___99 Refused |
| b. Information or advice provided by the program                                                                                                    | ___ Response ___98 Don't Know ___99 Refused |
| c. Information or advice from the energy audit                                                                                                      | ___ Response ___98 Don't Know ___99 Refused |
| d. The EnerGuide Label and designation itself                                                                                                       | ___ Response ___98 Don't Know ___99 Refused |
| e. Previous experience with the EnerGuide for Existing Houses program, or a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ___ Response ___98 Don't Know ___99 Refused |

### IMPACT OF MEASURES ON COMFORT LEVEL [IM SERIES]

IM1. As a result of the energy efficiency measures implemented through the program, has there been any change in the comfort levels inside your house for you or other occupants?

1. Yes
2. No
98. (Don't know)
99. (Refused)

IM2. [IF IM1 = 1]: What has been the change in comfort levels for you or other occupants in your house as a result of the energy efficiency measures implemented through the program? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

1. (Provided even temperatures throughout the home)
2. (Made it more convenient to control temperature automatically, day or night)
3. (Noticeably fewer drafts throughout home)
4. (Provided longer lasting hot water)
5. (Reduced the noise level of replaced appliances)
96. (Other [SPECIFY \_\_\_\_\_])



- 98. (Don't know)
- 99. (Refused)

### **EFFECTS OF MEASURES ON ENERGY BILLS [SM SERIES]**

SM1. Since you implemented these energy efficiency measures under the program, what changes, if any, have you noticed in your energy bills? Have ... READ STATEMENTS IN ORDER - RECORD ONE RESPONSE

- 1. Your bills gone down
- 2. Your bills gone up, or
- 3. Has there been no change in your bills
- VOLUNTEERED
- 4. (It is too soon to tell)
- 98. (Don't know)
- 99. (Refusal)

### **RECEPTIVITY TO OTHER POSSIBLE UPGRADES [RU SERIES]**

RU1. Are there any energy efficiency upgrades that were not covered by the program that you would like to have had covered through the program?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

RU2. [IF RU1 = 1] Which energy efficiency upgrades would you like to have covered by the program? PROBE: Anything else? [PROBE FOR SPECIFIC UPGRADES; ACCEPT MULTIPLE]

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_

## **RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS [R SERIES]**

R1. Do you have any recommendations for improving the EnerGuide for Existing Houses Program?

Probe: Anything else? [DO NOT READ. ACCEPT MULTIPLE]

1. (Offer more products/measures eligible to rebates)
2. (Offer more information on the products/measures recommended)
3. (Complete the first or final audit faster)
4. (Complete the first or final audit sooner)
5. (Lower the cost of the evaluation)
6. (Increase the delay given to complete the upgrades)
7. (Improve communication)
8. (Advertise the program more or in a better way)
9. (No recommendation)
96. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

R2. Would a figure illustrating the various steps to follow in order to participate in the EnerGuide for Existing Houses program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?

1.    \_\_\_   Significantly
2.    \_\_\_   Somewhat
3.    \_\_\_   Slightly
4.    \_\_\_   Not at all
96. (Depends on what the figure or illustration would have been)
97. (This kind of document already exists)
98. (Don't know)
99. (Refused)

**DEMOGRAPHIC CHARACTERISTICS [D SERIES]****[ASK ALL RESPONDENTS]**

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-7, SELECT ONE RESPONSE]

1. Detached single-family home
2. Semi-detached house
3. Mobile home or house trailer
4. Townhouse or duplex which share adjacent walls
5. Row house (Single story apartment building)
6. Apartment building that have fewer than five stories
7. Apartment building that have five or more stories
96. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

D2. How many bedrooms are in your home? [98=DK; Enter zero for a studio apartment with no bedrooms]

D5. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home
96. (Other Specify \_\_\_\_\_)
98. (Don't Know)
99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

**[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]**

D7. What is your age group? Are you... [READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation certificate)
2. (High school graduation certificate and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University certificate or diploma)
98. (Don't know)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
7. \$80,000 or more
98. (Don't know)
99. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

**THOSE ARE ALL THE QUESTIONS I HAVE FOR YOU. THANK AND TERMINATE.**

## APPENDIX VIII – ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the EEH Program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level

|                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did you have plans to implement the specific energy-efficient upgrades that were implemented through the program?                                                                                                                                                                                   | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to implement the energy-efficient upgrades that you implemented through the program?                                                                                                                                   | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have implemented exactly the same energy efficiency upgrades that you implemented through the program? (Scale 0 to 10)                                                                                                                                             | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have implemented standard equipment instead of energy-efficient equipment? (Scale 0 to 10)                                                                                                                                                                         | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                    | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)</b>                                                                                                                                          |
| <b>FR3.</b> If you had not received the rebate offered by the program, would you have paid for the full cost of the energy efficiency upgrades you implemented? ? (Scale 0 to 10)                                                                                                                                                                    | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                    | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3</b>                                                                                                                             |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c and e = Program factors<br>Factors d = Non Program factors                                                                                                                                                                                                                         | FR4_P = SUM(a; b; c; e)<br>FR4_NP = FR4d                                                                                                                                         |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                    | <b>100% -<br/>[FR4_P/(FR4_P+FR4_NP)]</b>                                                                                                                                         |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have implemented exactly the same energy efficiency upgrades that you implemented through the program <b>but at a later date</b> ? (Scale 0 to 10)                                                                                                                 | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have implemented these upgrades?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                    | <b>FR2cc</b>                                                                                                                                                                     |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                          | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                |

Subsequently, the final free-ridership level calculated for each participant was submitted to two inconsistency tests:

- > The first inconsistency test consisted in verifying if  $(FR2a - FR2b) \geq 30\%$ . In that case, the participant's answers to FR2a and FR2b represented an inconsistency and PA1 became equal to the smallest value between FR2a and FR2b. Otherwise, PA1 remained unchanged. Moreover, if the adjusted PA1 value was still  $\geq 50\%$  for a participant who had declared deciding to install the energy-efficient lighting products after learning about the program, PA1 was re-adjusted to 0%.
- > The second inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to FR3 represented an inconsistency and PA2 was removed from the final free-ridership calculation. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.



# **FUEL SUBSTITUTION PILOT IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 20, 2012



**ECONOLER**



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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Fuel Substitution Pilot. The 2011 evaluation was based on one in-depth interview with the Program Manager (PM), on eight on-site visits as well as on a telephone survey of 28 program participants.

## **PROGRAM OVERVIEW**

The Fuel Substitution Pilot has been added to Efficiency Nova Scotia Corporation's (ENSC) program portfolio in 2011. It provides financial incentives to homeowners to encourage them to reduce the level of electricity they use for home heating and/or domestic hot water (DHW). The pilot allows participants to either substitute a portion of their electric system or the whole system for a non-electrical space or DHW system.

ENSC offers incentives for new central heating systems, area space heaters (stoves) and DHW equipment. Additional rebates are available to homes where the electric system is completely removed and replaced with a new distribution system. Heritage Gas, one of the partners, also offers incentives for switching to natural gas.

In order to take part in the pilot, homeowners had to meet certain eligibility criteria that varied depending on the heating source and the measure to be implemented through the pilot.

Since Fuel Substitution is a pilot, no official target was established. However, net savings of 1.8 GWh were expected for 2011.

## **KEY FINDINGS**

The 2011 evaluation of the Fuel Substitution Pilot demonstrated that the program has great potential for success considering that it was a pilot. The program totalled 296 participants for the year 2011. In terms of net energy savings, the program generated 1.570 GWh.

### **Awareness**

In its current form, the Fuel Substitution Pilot does not include many partners. No delivery agents, contractors or retailers have been approached to assist ENSC in the different aspects of program logistics. Therefore, application forms, for instance, were processed by ENSC, and its managers contacted homeowners who wished to participate in the pilot to verify their eligibility.

Survey results showed that half of the participants learned about the Fuel Substitution Pilot at the store where they purchased their new equipment. This goes to show that commercial partners (stores)

constitute a key element for the future success of this kind of program. Through potential partnerships between ENSC and retailers or other entities, this kind of program could benefit from greater promotion and wider distribution. In addition to working with stores, an upstream advertising campaign should target homeowners before they are at the stage of shopping. This aims to influence decision making of homeowners who have not already decided to replace or substitute their electric space heating/DHW system.

## **Satisfaction**

Satisfaction towards the pilot was very high among participants. Indeed, no participants interviewed during the telephone survey mentioned being dissatisfied either with the pilot or with any of its aspects. Moreover, all participants responded that they would recommend the Fuel Substitution Pilot to a family member or a friend. Participants surveyed through the 2011 evaluation mentioned suggestions to improve the pilot. The main recommendation made was to advertise the pilot more or in a better way.

## **Program Energy Savings**

To calculate the net savings of the Fuel Substitution Pilot in 2011, Econoler reviewed the gross savings estimated by ENSC. Moreover, Econoler took into consideration the free-ridership and spillover measured as part of the participant survey. Through this approach, a free-ridership level of 42 percent was captured, while no spillover was identified.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 42%         |
| Spillover Level      | 0%          |
| Net-to-Gross Ratio   | 0.58        |

The evaluation revealed that the Fuel Substitution Pilot had generated net energy savings of 1.570 GWh at the generator and demand savings of 0.785 MW at the generator in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Gross Savings    | NTGR        | Net Savings      |
|---------------------------|------------------|-------------|------------------|
| <b>Energy Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 2.741 GWh        | 0.47        | 1.300 GWh        |
| <b>Evaluation Results</b> | <b>2.707 GWh</b> | <b>0.58</b> | <b>1.570 GWh</b> |
| <b>Demand Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 1.371MW          | 0.47        | 0.641 MW         |
| <b>Evaluation Results</b> | <b>1.353 MW</b>  | <b>0.58</b> | <b>0.785 MW</b>  |

The net energy values calculated were compared to the pilot tracked savings for 2011. The values calculated for the pilot are significantly higher than those calculated from the tracking sheet. This can be explained by the difference between the NTGR calculated for this evaluation and the one applied by the PM to tracked savings. The NTGR value in the tracked savings varied from 1 for natural gas heating systems to as low as 0.23 for natural gas DHW systems compared to the 0.58 value calculated for the evaluation.

## RECOMMENDATIONS

Building on lessons learned from the Fuel Substitution Pilot, ENSC is considering transforming the latter into a service that promotes green heating systems. This service would be client-centric and allow customer to implement green heating systems regardless of their current heating systems. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the pilot or a similar program:

- Fuel-R1. Consider making partnerships for program expansion:** At this point, the program is a pilot and does not include delivery agents (DAs) or contractors for instance. For such a pilot to become a program, a DA would be useful along with competent subcontractors in order to have better control over program implementation. The DA could be involved once the program generates enough participants.
- Fuel-R2. Increase awareness through upstream advertising and collaboration with stores:** Survey results showed that half of the 2011 participants had learned about the pilot at the store where they had purchased their equipment. For this kind of program, collaborating with commercial partners such as stores would represent a way to increase promotion as well as act as a lever to strengthen awareness. However, upstream advertising should also be done in order to influence decision making among

homeowners who have not already decided to replace or substitute their equipment, which could reduce the level of free-ridership observed.

- Fuel-R3. Improve the tracking sheet with additional information:** First, project status, whether completed or in progress, should be clearly defined to facilitate the selection of projects for which savings can be claimed. Second, the tracking sheet does not include any information on the capacity of the old and new systems. Having this information on hand could help justify the savings allocated by the PM to the new measure implemented, especially in situations where values different from the prescriptive value are used. Finally, collecting information on the heating load provided by a secondary heating source would give a basis for savings adjustment when high usage of a secondary heating source is identified.
- Fuel-R4. Conduct a billing analysis in order to evaluate energy consumption for heating:** A billing analysis would provide a more precise evaluation of the energy consumption for heating as well as a better evaluation of energy savings. The household average heating consumption value is the main assumption for calculating the energy savings and should be evaluated specifically for participants using a billing analysis.
- Fuel-R5. Continue targeting participants who could install natural gas systems:** The survey results showed that the pilot had had a great influence in the decision to convert a heating system from electricity to natural gas, compared to other conversions. Increasing the number of participants installing natural gas systems could potentially reduce the free-ridership level, resulting in a higher NTGR for the program. Moreover, conversions to natural gas heating systems present higher unitary savings as these systems seldom require the use of a secondary heating system.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION**

Efficiency Nova Scotia Corporation (ENSC) launched the Fuel Substitution Pilot in 2011. This pilot targets all existing homes across Nova Scotia that use electricity as their primary source for home heating and/or domestic hot water (DHW). It encourages homeowners to reduce the level of electricity they use for home heating and/or DHW. The pilot allows homeowners to either substitute their electric space heating with another heating source, such as a wood or pellet stove, or to completely remove their electric space heating/DHW system and replace it with a new heating source.

ENSC offers incentives for new central heating systems, area space heaters (stoves) and DHW equipment. Additional rebates are available to homes where the electric system is completely removed and replaced with a new distribution system. Heritage Gas, one of the partners, also offers incentives for switching to natural gas.

If they wish to participate in the pilot, homeowners apply to ENSC directly by filling out a pre-approval application form. Then, the program manager gets in touch with them to verify their eligibility. Eligibility considerations are mainly related to heating source (electricity) and electrical energy consumption but can also vary depending on the type of measure implemented under the program. Program eligibility is described in detail in the program manual in three sections:

- > overall program eligibility;
- > wood/pellet additional eligibility; and
- > natural gas additional eligibility.

The marketing strategy for this pilot includes a series of activities including radio, newspaper and online advertising, web presence, direct mails and home shows.

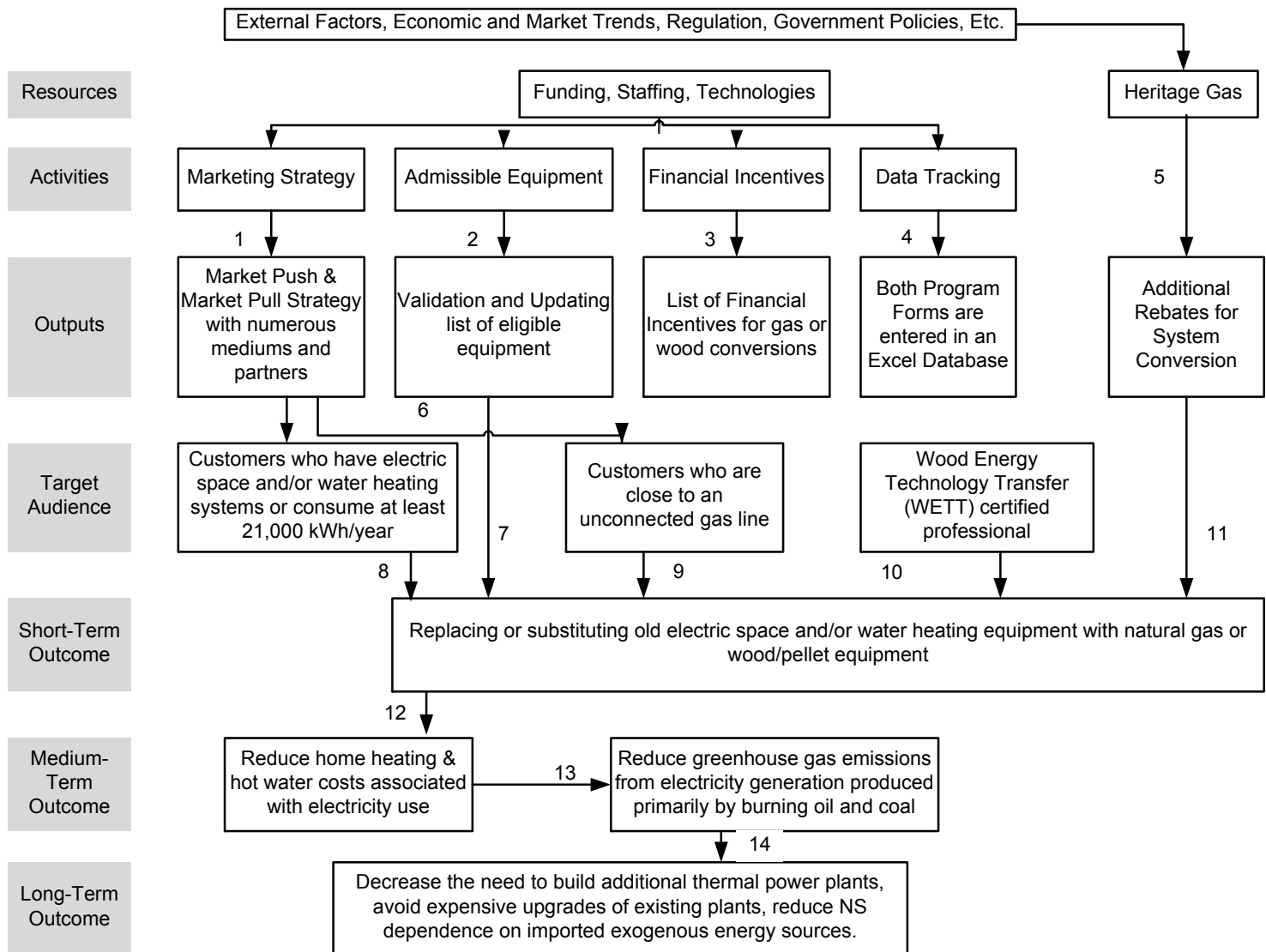
Since Fuel Substitution is a pilot, no official target was established. However, net savings of 1.8 GWh were expected for 2011.



## 1.2 PILOT LOGIC MODEL

The Fuel Substitution Pilot logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Fuel Substitution Pilot Logic Model<sup>1</sup>**



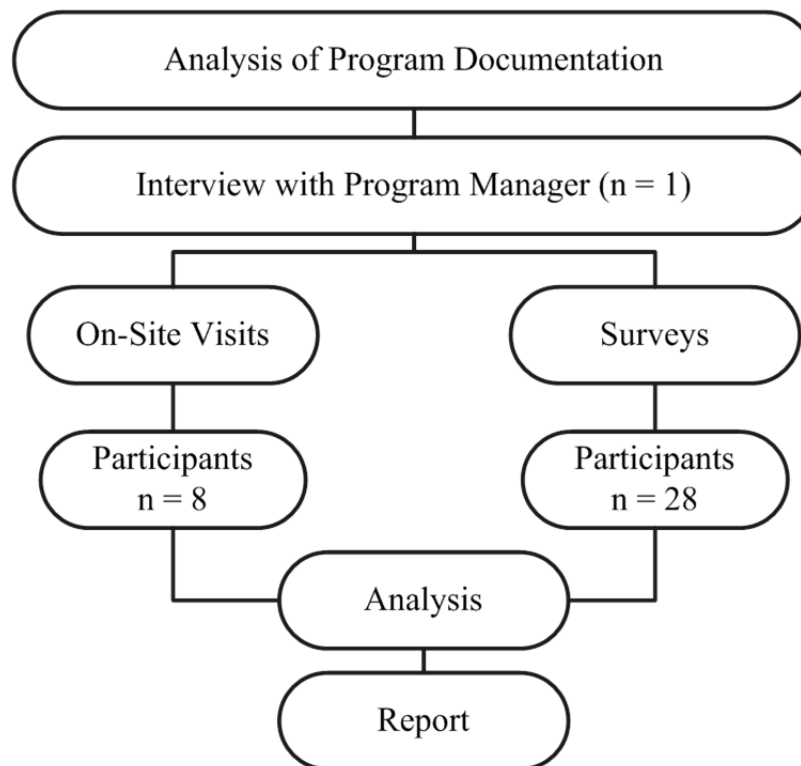
<sup>1</sup> The numbers 1 through 14 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guide and the survey questionnaire are included in Appendices IV and V.

**Figure 2: Methodological Model**



## 2.2 METHODOLOGY DESCRIPTION

### 2.2.1 Analyzing Existing Pilot Information

The first task in the process evaluation of the Fuel Substitution Pilot was the analysis of the documentation. At that stage, all available information was reviewed.

The information used to conduct this analysis was obtained primarily from the following sources:

- > ENSC website;
- > pilot manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one in-depth interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > pilot justification and theory;
- > calculation of gross and net savings;
- > pilot barriers;
- > pilot marketing and outreach strategy;
- > participation forms and flow chart; and
- > role of the partners.

### **2.2.3 On-Site Visits**

In October and November, eight on-site visits were conducted at households that participated in the Fuel Substitution Pilot. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These visits were used to validate the new measures implemented, collect information on the previous heating and hot water system as well as gather data on the usage of the different energy sources available at the site.

The methodology used for the on-site visits under the Fuel Substitution Pilot is further explained in the impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VI.

### **2.2.4 Participant Survey**

A telephone survey with a total of 28 pilot participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October and November utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 11 minutes.

The participant survey was used to gain a better understanding of the following pilot features:

- > how participants learned about the pilot;
- > participant motivations and barriers;
- > spillover and free-ridership;
- > impact of the pilot; and
- > satisfaction with the pilot.

The demographic profile of survey respondents is shown in Appendix III. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2011 telephone survey.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population       | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|------------------|-----------------|-------------------------------------------|
| 2011 Participants | 296 <sup>2</sup> | 28              | ±14.8%                                    |

---

<sup>2</sup> The population for the 2011 survey was 64 participants at the time of establishing the sample for the survey.

## 3 PROCESS EVALUATION

### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted on the Fuel Substitution Pilot focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance pilot performance.

This process evaluation was performed through an interview with the PM as well as through a telephone survey of program participants.

### 3.2 PILOT MANUAL CONTENT

Since Fuel Substitution is a pilot, the manual is not as exhaustive as a program manual.

There is no perfect example of program manual content. Indeed, program manuals are usually custom-designed to meet an organization's specific needs. However, standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what is presented in the Fuel Substitution manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | Fuel Substitution Manual |
|--------------------------------------------------------------------------------------------------------------|--------------------------|
| Document revisions                                                                                           | ✓                        |
| Program description (including nature or type of program)                                                    | ✓                        |
| Program justification                                                                                        | ⚠                        |
| Program objectives                                                                                           | ✓                        |
| Incentives                                                                                                   | ✓                        |
| Eligibility criteria                                                                                         | ✓                        |
| Program partners and their roles                                                                             | N/A                      |
| Program barriers                                                                                             | ✓                        |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                        |
| Details about the savings calculations and type of measures                                                  | ⚠                        |
| Budget per year                                                                                              | ✓                        |
| Cost-effectiveness test results                                                                              | ✓                        |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                                              | Fuel Substitution Manual |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                                                       | ✓                        |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                                                      | ⚠                        |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                                                     | ⊘                        |
| Program theory                                                                                                                                                                                                                                                                                                                                                                                      | ⊘                        |
| Logic model                                                                                                                                                                                                                                                                                                                                                                                         | ⊘                        |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                                          | ✓                        |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                                           | N/A                      |
| Program forms                                                                                                                                                                                                                                                                                                                                                                                       | ✓                        |
| <div>  Information included in the program manual<br/>  Information partially included in the program manual<br/>  No information         </div> |                          |

Econoler analyzed the Fuel Substitution Pilot manual. It contains relevant information useful for both the PM and the Evaluator. Notably, eligibility considerations of the program as well as marketing initiatives and program procedures are well documented. However, Econoler has the following recommendations to supplement and improve the tool:

- > **Document important program practices:** The table showing the different rebates for each option is well detailed in the pilot manual. However, for internal tracking and modification purposes, the source of calculation for each rebate should be documented in the manual, including the presumed costs participants have to pay for each measure.
- > **Add information to the pre-approval application form for administrative purposes:** Econoler recommends that the pre-approval application form include an ID number. It should also include a revision date in case mid-course modifications are made to the pilot. Finally, beside the electric utility account number, the utility name should be identified.
- > **Provide a “base case”:** The manual does not provide a “base case” that gives information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.

- **Provide the parameters used to estimate the objectives:** After estimating the gross savings from the base case established in the manual, the objectives are then forecast in terms of net savings. To that effect, the objectives include any distortion effects, whether positive or negative. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The pilot manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the pilot objectives. The parameters should then be adjusted annually based on the most recent evaluation results.

### 3.3 PILOT SAVINGS TRACKING

Econoler has reviewed the content of the tracking sheet for ENSC's Fuel Substitution Pilot. In general, the tracking sheet is useful to the PM and provides a way to monitor the status of the applications to the pilot. Most fields necessary for pilot administration and evaluation are present. Energy savings are presented for each project in the tracking sheet.

The tracking sheet presents information in one sheet that lists both customer information and measure details. Each project has a unique identification number that can be used as a reference. The tracking sheet includes all projects for which an application was submitted, even if the project was not approved or is not completed.

All customer information necessary to conduct field activities (surveys and on-site visits) was present in the tracking sheet. The measure details fields include information on the existing system and the measure implemented, such as the energy source or type of measure. Both gross and net energy savings are calculated in the tracking sheet. In one instance, a discrepancy was found on savings allocated to one project. The savings presented were twice the prescriptive savings for the corresponding measure but the information presented in the tracking sheet for this measure did not provide any justification for such savings. However, the PM indicated that a billing analysis had been conducted for that particular project, thereby justifying the savings applied.

The energy savings values are defined by the PM based on the information provided by participants in their application. The only information required to define the energy savings is the type of system selected for fuel substitution. In 2010, prescriptive savings for each type of system were estimated by Dunskey Energy Consulting<sup>3</sup> for ENSC. For each project, the PM selects the appropriate savings, based on which measure the participant implemented. The net savings are then calculated by using the net-to-gross ratio (NTGR) also estimated in the Dunskey study.

---

<sup>3</sup> Dunskey Energy Consulting, *Residential Fuel Substitution Pilot Program*, Final report, December 2010.

Some adjustments could be made in the future to improve tracking sheet consistency and the evaluation process. The Evaluator recommends to:

- > **Clearly define project status in the tracking sheet:** The tracking sheet provided includes all the applications submitted. Project status, whether completed or in progress, should be clearly defined to facilitate the selection of projects for which savings can be claimed.
- > **Collect details on heating and/or Domestic Hot Water (DHW) system capacity:** The tracking sheet does not present any information on the capacity of the old and new systems. Having this information on hand could help justify the savings allocated by the PM to the new measure implemented, especially in situations where values different from the prescriptive value are used.

### **3.4 PILOT DESIGN AND IMPLEMENTATION**

Following the analysis of all pilot elements, the Evaluator concludes that the Fuel Substitution Pilot is a good first step to reducing electricity use for home heating and/or DHW, lowering the production of secondary energy from coal or oil and curbing greenhouse gas emissions. Building on the lessons learned from the pilot, ENSC is considering transforming the Fuel Substitution Pilot into a client-centric service that would promote green heating systems regardless of the current heating system of a given house. Even though ENSC is considering transforming the Fuel Substitution Pilot, mentions of possible improvements remain relevant for future programs.

- > **Develop an evaluation plan in parallel with program design and development:** This pilot has no evaluation plan. Econoler strongly recommends that for each new pilot or program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Provide examples in the program brochure:** The collateral activities of the pilot include the publication and distribution of information in the form of a brochure. The Evaluator recommends including real implementation examples that illustrate the savings generated for switching. This could be accomplished once the participant number is sufficient to document such cases.
- > **Consider partnering with a delivery agent and subcontractors in a near future:** The Evaluator notices that there are different fuel substitution scenarios and many rebates and conditions to be eligible for the pilot. For such a program, a delivery agent (DA) would be useful along with competent subcontractors in order to have a better control on program implementation. The DA could be involved once the program generates enough participants.



### 3.5 ENSC WEBSITE

Customers can consult the ENSC website to find a large amount of information regarding the pilot, such as rebate amounts and eligibility criteria. However, Econoler noticed that in certain sections of the pilot page, acronyms are used without having been defined first. For instance, in the “Wood & Pellet Furnaces or Boilers” section, the acronym WETT is found without being defined first. This should be corrected throughout for those who are not familiar with this acronym.

### 3.6 PARTICIPANT PERSPECTIVES

#### 3.6.1 Pilot Awareness

Fifty percent of participants learned about the Fuel Substitution Pilot at the store where they purchased their new equipment. This result shows the importance of commercial partners (stores) in program promotion. Other ways through which customers learned about the pilot include word of mouth (29%), the ENSC website (14%) or the Internet in general (14%).

**Table 5: How Participants Found Out About the Pilot**

| <b>How Participants Found Out About the Pilot</b> | <b>2011</b> |
|---------------------------------------------------|-------------|
| <i>Sample Size</i>                                | <i>28</i>   |
| The store where you purchased your new equipment  | 50%         |
| Co-worker, family, friend or word of mouth        | 29%         |
| On the ENSC website                               | 14%         |
| Internet—unspecified                              | 14%         |
| Email from Heritage Gas                           | 4%          |
| Print brochure                                    | 4%          |
| Other                                             | 14%         |

### 3.6.2 Participation Motivations and Barriers

The main reason for participating in the pilot is to save on energy costs (86% offering this response as their most important motivation), followed by one in 10 wanting to have a backup heating source (11%). There were a variety of mentions in terms of secondary motivations including to make the home more energy efficient, benefit from additional comfort and help the environment.

Communications should emphasize to customers the opportunities to save on energy bills since it is by far the main motivation for participating in the pilot.

**Table 6: Reasons for Participating**

| Reasons for Participating          | 2011                      |                                  |
|------------------------------------|---------------------------|----------------------------------|
|                                    | Most Important Motivation | Second Most Important Motivation |
| <i>Sample Size</i>                 | 28                        | 28                               |
| Save on energy costs/bills         | 86%                       | 11%                              |
| To have a backup heating source    | 11%                       | 14%                              |
| To make home more energy efficient | --                        | 11%                              |
| For better comfort                 | --                        | 7%                               |
| To help the environment            | --                        | 7%                               |
| Other                              | 4%                        | 14%                              |
| Nothing                            | --                        | 14%                              |
| Don't know                         | --                        | 25%                              |
| Refused                            | --                        | 4%                               |

Just four percent, or one respondent, had concerns prior to taking part in the pilot. This concern was whether the new heating system would be efficient.

**Table 7: Concerns with Pilot Prior to Taking Part**

| Concerns with Pilot Prior to Taking Part | 2011 |
|------------------------------------------|------|
| <i>Sample Size</i>                       | 28   |
| Yes                                      | 4%   |
| No                                       | 96%  |

One in 10 respondents (11%) reported that there had been challenges or barriers faced when implementing the new measure through the Fuel Substitution Pilot. From the three respondents who reported challenges, comments in relation to pellet stoves (installing or carrying pellets for the stove), the possibility of purchasing used equipment instead and the cost of the stove were mentioned as barriers (respondents could give more than one response to this question).

The results related to concerns prior to taking part in the pilot and challenges faced in implementing the new measures indicate no important barrier to the Fuel Substitution Pilot.

**Table 8: Challenges Faced in Implementing the New Measure**

| Challenges or Barriers Faced in Implementing the New Measure or the New Energy Source | 2011 |
|---------------------------------------------------------------------------------------|------|
| <i>Sample Size</i>                                                                    | 28   |
| Yes                                                                                   | 11%  |
| No                                                                                    | 89%  |

### 3.6.3 Pilot Influence

Survey respondents were asked questions about the influence of the pilot on their decision to replace or substitute their space heating system or domestic hot water system. According to their responses, the pilot rebate was important in influencing their decision (mean of 7.5). In addition, information or advice about the pilot was also deemed rather important in influencing their decision (mean of 6.8).

**Table 9: Importance of Pilot in Influencing Decision**

| Importance of Pilot in Influencing Decision to Replace or Substitute Space Heating or Domestic Hot Water System | 2011 |
|-----------------------------------------------------------------------------------------------------------------|------|
| <i>Sample Size</i>                                                                                              | 28   |
| Mean (0=Not at all important, 10=Extremely important)                                                           |      |
| Pilot rebate                                                                                                    | 7.5  |
| Information or advice provided through the pilot                                                                | 6.8  |

### 3.6.4 Impacts of the Pilot

Three in 10 respondents have noticed that their energy bills have gone down since the new measure was implemented under the Fuel Substitution Pilot (29%). These results should be relativized with the fact that there was a short interval between the survey and the implementation of new measures. Indeed, 46 percent of respondents indicated that it had not been long enough for them to make an assessment about their change in energy bills and 25 percent did not see a change in their bill.

**Table 10: Changes Noticed in Energy Bills since Implementation**

| Impact on Energy Bills          | 2011 |
|---------------------------------|------|
| <i>Sample Size</i>              | 28   |
| Bills have gone down            | 29%  |
| Bills have gone up              | --   |
| No change in the bills          | 25%  |
| Hasn't been long enough to know | 46%  |
| Don't know                      | --   |

Three-quarters of respondents reported that there had been an improvement in their interest in energy efficiency (75% offering a rating of 5 or 4, where 5 is "considerable improvement") since participating in the Fuel Substitution Pilot. Just under six in 10 reported that there had been improvement in their knowledge of energy efficiency (57%).

**Table 11: Improvements since Participating in Pilot**

| Improvements                   | Sample Size | 2011<br>Rating: 5= "considerable improvement"<br>and 1= "no improvement" |     |     |    |    |    |    |
|--------------------------------|-------------|--------------------------------------------------------------------------|-----|-----|----|----|----|----|
|                                |             | 5                                                                        | 4   | 3   | 2  | 1  | DK | NA |
| Interest in energy efficiency  | 28          | 54%                                                                      | 21% | 21% | -- | 4% | -- | -- |
| Knowledge of energy efficiency | 28          | 14%                                                                      | 43% | 29% | 7% | 7% | -- | -- |

### 3.6.5 Satisfaction with Pilot

Nearly all respondents are satisfied (96%) with the Fuel Substitution Pilot overall and nine in 10 (89%) reported a very high level of satisfaction. Of note, none were dissatisfied.

**Table 12: Satisfaction with Overall Experience**

| Satisfaction with Overall Experience | 2011 |
|--------------------------------------|------|
| Sample Size                          | 28   |
| Very satisfied                       | 89%  |
| Satisfied                            | 7%   |
| Neither satisfied nor dissatisfied   | 4%   |
| Dissatisfied                         | --   |
| Very dissatisfied                    | --   |

Respondents are highly satisfied with various aspects of the Fuel Substitution Pilot. Specifically, just under nine in 10 offered a rating of 5, or “very satisfied,” in regard to the interaction and communication with ENSC staff (86%), the rebate or incentive amounts (86%) and the initial confirmation of eligibility (85%). Eight in 10 are very satisfied with the ease of understanding information about the pilot (79%), while three-quarters are very satisfied with the time required to receive their rebate or incentive (75%). Seven in 10 are very satisfied with the measure implemented in their home (71%) and over six in 10 are very satisfied with the pilot application, forms and associated paperwork (64%). By combining the rates of 4 and 5, the Evaluator finds that there are more than nine in 10 respondents who are satisfied with all aspects evaluated. Notably, no respondent offered a rating of 1 or 2 (where 1 is “very dissatisfied”) for any of the aspects under consideration.

**Table 13: Satisfaction with Pilot Aspects**

| Satisfaction with Pilot Aspects                   | Sample Size* | 2011<br>Rating: 5= ‘very satisfied’ and<br>1 = ‘very dissatisfied’ |     |    |    |    |
|---------------------------------------------------|--------------|--------------------------------------------------------------------|-----|----|----|----|
|                                                   |              | 5                                                                  | 4   | 3  | 2  | 1  |
| Interaction and communication with ENSC staff     | 28           | 86%                                                                | 14% | -- | -- | -- |
| Rebate or incentive amounts                       | 28           | 86%                                                                | 7%  | 7% | -- | -- |
| Initial confirmation of eligibility               | 27           | 85%                                                                | 15% | -- | -- | -- |
| Ease of understanding information about the pilot | 28           | 79%                                                                | 18% | 4% | -- | -- |
| Time required to receive rebate or incentive      | 28           | 75%                                                                | 21% | 4% | -- | -- |
| The measure implemented in your home              | 28           | 71%                                                                | 29% | -- | -- | -- |
| Pilot application, forms and associated paperwork | 28           | 64%                                                                | 32% | 4% | -- | -- |
| *Don't know/no answer removed from calculations   |              |                                                                    |     |    |    |    |

All participants would recommend the Fuel Substitution Pilot to a family member or friend. This result is a strong indicator of satisfaction.

**Table 14: Value of the Pilot**

| <b>Would Recommend the Pilot to a Family Member or Friend</b> | <b>2011</b> |
|---------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                            | 28          |
| Yes                                                           | 100%        |
| No                                                            | --          |

### 3.6.6 Recommendations for Improvement

Respondents were asked if they had any recommendations for improving the pilot. Two in 10 believed the pilot could be better advertised (18%) while under one in 10 mentioned improving communication (7%) or increasing the rebate amount (7%). Over six in 10 respondents (61%) did not offer recommendations as to how the pilot could be improved.

Worthy of note is that one respondent mentioned that he could not find the application form on the Internet because it was a pilot. He had to call for assistance to find it. As suggested by results related to the source of pilot awareness (see Section 3.6.1), the Internet seems a rather important source of information for participants.

**Table 15: Recommendations to Improve Pilot**

| <b>Recommendations to Improve Pilot</b>                    | <b>2011</b> |
|------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                         | 28          |
| Advertise the pilot more or in a better way                | 18%         |
| Improve communication                                      | 7%          |
| Increase rebate amount                                     | 7%          |
| Offer more products/measures to be installed/implemented   | 4%          |
| Simplify pilot application, forms and associated paperwork | 4%          |
| Other                                                      | 11%         |
| No recommendations                                         | 54%         |
| Don't know                                                 | 7%          |

Just under six in 10 respondents believe a diagram illustrating the steps involved in the program would have facilitated their participation, with 36 percent offering a rating of “significantly,” and 21 percent offering a rating of “somewhat.”

This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future participants.

**Table 16: Provision of a Diagram Illustrating Steps of Pilot**

| <b>Diagram Illustrating Steps of Pilot would have Facilitated Participation</b> | <b>2011</b> |
|---------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                              | 28          |
| Significantly                                                                   | 36%         |
| Somewhat                                                                        | 21%         |
| Slightly                                                                        | 14%         |
| Not at all                                                                      | 29%         |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation aims at determining the gross and net savings of the pilot for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > unitary savings for each type of system replaced;
- > supplemental heating source usage;
- > free-ridership; and
- > spillover.

The impact evaluation was based on a review of the pilot tracking sheet, eight on-site visits and 28 participant surveys.

The review of the pilot tracking sheet included an analysis of the information used to calculate savings for the different eligible measures. As recommended in the Savings Verification Study for 2010 demand-side management DSM programs, on-site visits were performed for each sub-category of equipment installed, except when savings in a sub-category were deemed too low to require a site visit. On-site visits were used to verify the type of new system installed in participants' facility as well as to collect information on the usage of different energy sources. The data collected during these two activities were used to establish the energy savings for each type of new system.

The participant surveys provided information to calculate the NTGR for this pilot, including free-ridership and internal spillover. The NTGR was used to calculate pilot net savings.



#### 4.1.1 On-Site Visit Sampling and Protocol

##### Sampling Methodology

Sampling was established from the pilot tracking sheet provided by ENSC. This list provided 296 participants for 2011 with completed projects. However, from those 296 participants, one received a rebate for the installation of heating equipment accessory and not for the heating equipment itself. Thus, as no savings were considered for this particular project, the latter was not considered for the remainder of the impact evaluation.

Table 17 presents the number of projects completed for each type of heating system installed.

**Table 17: Total Number of Projects Completed for each Category of System Installed**

|                               | Category of System Installed |              |                          |                               |                        |                                    |
|-------------------------------|------------------------------|--------------|--------------------------|-------------------------------|------------------------|------------------------------------|
|                               | Wood Stove                   | Pellet Stove | Pellet Furnace or Boiler | Natural Gas Furnace or Boiler | Wood Furnace or Boiler | Natural Gas Condensing DHW Systems |
| Total Number of Installations | 143                          | 138          | 3                        | 3                             | 6                      | 2                                  |
| Total Gross Savings (MWh)     | 1,181.04                     | 1,043.14     | 49.30                    | 88.82                         | 98.84                  | 10.74                              |
| % of Total Savings            | 47.78%                       | 42.20%       | 1.99%                    | 3.59%                         | 4.00%                  | 0.43%                              |

Most of the systems installed were in the wood stove and pellet stove categories. However, savings from the pellet furnace or boiler category and from the natural gas furnace or boiler category were sufficient to require one on-site visit each, despite representing very few installations. Finally, no on-site visit was conducted for the wood furnace or boiler category since no project had been completed for this category at the time of sampling.

For each category of systems, sites were selected randomly. A list of preferred regions located close to larger regional centres was established for site selection. The following regions were considered for site selection:

- > Halifax;
- > Dartmouth;
- > Sydney and North Sydney;
- > Coldbrook and Kentville; and
- > Pictou County.

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## **On-Site Visit Protocols**

An on-site visit protocol listing the information to be collected for each site was developed for this pilot. For each site, the type and characteristic of the heating or hot water systems as well as the heat source were collected. Moreover, information pertaining to the type of usage for the different systems installed on site was also gathered.

The detailed on-site visit protocol is presented in Appendix VI.

## **4.2 GROSS SAVINGS**

The gross savings estimate was computed based on a review of the information available in the pilot tracking sheet.

The tracking sheet provided by the PM for 2011 contained a total of 295 completed projects with energy savings. Additionally, one project that did not result in any energy savings was eligible through the pilot. For each type of system eligible for the pilot, and to which energy savings were allocated, a unitary savings value was defined by the PM for each type of space heating, water heating or combination retrofit offered by the pilot.

### **4.2.1 Unitary Savings Values**

The unitary savings values estimated by Dunskey were calculated using gross savings values established by Navigant Consulting<sup>4</sup> for each retrofit situation, and adjusted to account for the electricity requirement to operate non-electric heating and hot water systems. The energy savings estimates provided by Navigant Consulting were calculated using whole building simulation modeling with the eQuest tool as well as using engineering estimates from various sources. The annual electricity consumption value for heating of existing homes in Nova Scotia estimated by Navigant Consulting is 17,335 kWh. This value was compared to the value used by the Ontario Power Authority (OPA) for existing houses. The OPA uses an annual energy consumption value of 17,000 kWh for existing houses in its Pellet Stove program, consistent with the value reported by Navigant Consulting. This value was obtained from the OPA Prescriptive Measures and Assumptions report<sup>5</sup>. However, it is to be noted that the electricity consumption value provided by the OPA is for the general population of existing residential homes only. Consequently, it might not be representative of pilot participants. The decision to convert a residential heating system could be due to homeowners wishing to reduce their energy costs, probably because of the high energy consumption of their house. For future evaluations, a billing analysis could be conducted specifically for participants who

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<sup>4</sup> Navigant Consulting, 2011 to 2019 Fuel Substitution Potential Analysis, February 2010.

<sup>5</sup> Ontario Power Authority (OPA), "2011 Prescriptive Measures and Assumptions,"  
<http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists>.

convert their heating system. Such analysis would provide a more precise evaluation of the energy consumption for heating under this program.

Where deemed appropriate, savings values provided by Navigant Consulting were adjusted by Dunskey using HOT2000 simulations. The following assumptions were used by Dunskey:

- > an electricity requirement of 260 kWh per year to operate furnace systems;
- > an electricity requirement of 700 kWh per year to operate pellet stoves; and
- > 30 percent of the energy used by hybrid wood heating systems is electricity.

The savings values obtained by Dunskey are deemed appropriate since they are based on the electricity consumption value provided by Navigant Consulting and were adjusted to take into account additional electricity requirements to operate the new systems installed.

The unitary savings values used in the tracking sheet were established for each category and measure, using the values established by Dunskey. Table 18 presents the unitary energy and demand savings used in the tracking sheet and for the evaluation, as well as the details as to how each value was obtained. Most savings were established for systems installed in single-family dwellings, except for one case.

**Table 18: Unitary Savings Values for the Fuel Substitution Pilot**

| System Category                                     | Annual Electricity Savings (kWh/year) | Demand Savings (kW) | Comments                                                                                                                         |
|-----------------------------------------------------|---------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Wood Stoves                                         | 8,259                                 | 4                   | -                                                                                                                                |
| Pellet Stoves                                       | 7,559                                 | 4                   | -                                                                                                                                |
| Wood Furnaces or Boilers                            | 16,473                                | 7.66                | This value is the average of the values calculated by Dunskey for a wood furnace and a wood boiler.                              |
| Hybrid Wood Central Furnaces or Boilers             | 11,487                                | 7.66                | This value is the average of the values calculated by Dunskey for a hybrid wood furnace and a hybrid wood boiler.                |
| Central Natural Gas Heating Systems                 | 16,677                                | 7.66                | This value is the average of the values calculated by Dunskey for a natural gas furnace and for a condensing natural gas boiler. |
| Gas Combo Boilers                                   | 22,206                                | 10.34               | -                                                                                                                                |
| Wood Pellet Boilers                                 | 16,433                                | 7.75                | -                                                                                                                                |
| Combo Pellet Boilers                                | 22,206                                | 7.75                | -                                                                                                                                |
| Propane Furnaces                                    | 16,802                                | 7.57                | -                                                                                                                                |
| Natural Gas Boilers for Multi-Family Dwellings (MF) | 42,535                                | 47.53               | -                                                                                                                                |
| Natural Gas Condensing DHW Systems                  | 5,370                                 | 0.63                | -                                                                                                                                |
| Propane Tankless DHW Systems                        | 5,364                                 | 0.63                | -                                                                                                                                |

#### **4.2.2 On-Site Visit Results**

The information collected during on-site visits confirmed that the systems for which a rebate was claimed through the pilot were installed and used as the main source of heating. However, for two sites, the new heating system installed was not used as the main heating source. One site reported using the new heating source to cover only 25 percent of its heating needs while the other site reported using the new heating source to cover 50 percent of its heating needs. Moreover, information on usage of the old heat source was also collected and revealed that only one site had a supplemental heating source prior to participating in the pilot.

No correction factor was established based on the site visit results. However, the proportion of the total heating load provided by a secondary heating source before and after fuel substitution should be investigated. This will allow the identification of situations in which savings should be adjusted based on a high usage of the secondary heating source. This information could be collected on the application form. As a matter of fact, a question on the usage of a secondary heating source is already included in this form.

#### **4.2.3 Revised Gross Savings**

The annual gross savings for each category of systems installed through the Fuel Substitution Pilot are presented in Table 19. They were calculated using the unitary savings values provided in this report. Overall, total gross energy and demand savings amount to 2.450 GWh and 1.225 MW at the meter. Gross savings at generator level are also estimated in Table 19, using a line loss factor between the meter and the generator of 1.105. This value was provided by NSPI for residential dwellings. Using that factor, total gross energy and demand savings at the generator are estimated at 2.707 GWh and 1.353 MW.

**Table 19: Evaluation Results – Gross Energy and Demand Savings**

| System Category                                        | Wood Stoves  | Pellet Stoves | Wood Furnaces or Boilers | Hybrid Wood Central Furnaces or Boilers | Central Natural Gas Heating | Gas Combo Boilers | Pellet Furnaces or Boilers | Combo Pellet Boilers | Propane Furnaces | Natural Gas Boilers (MF dwellings) | Natural Gas Condensing DHW | Propane Tankless DHW |
|--------------------------------------------------------|--------------|---------------|--------------------------|-----------------------------------------|-----------------------------|-------------------|----------------------------|----------------------|------------------|------------------------------------|----------------------------|----------------------|
| <b>Number of Units</b>                                 | 143          | 138           | 6                        | 0                                       | 0                           | 3                 | 3                          | 0                    | 0                | 0                                  | 2                          | 0                    |
| <b>Energy Savings</b>                                  |              |               |                          |                                         |                             |                   |                            |                      |                  |                                    |                            |                      |
| Unitary energy savings (kWh)                           | 8,259        | 7,559         | 16,473                   | 11,487                                  | 16,677                      | 22,206            | 16,433                     | 22,206               | 16,802           | 42,535                             | 5,370                      | 5,364                |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>1.181</b> | <b>1.043</b>  | <b>0.099</b>             | <b>0</b>                                | <b>0</b>                    | <b>0.067</b>      | <b>0.049</b>               | <b>0</b>             | <b>0</b>         | <b>0</b>                           | <b>0.011</b>               | <b>0</b>             |
| Line loss factor                                       | 1.105        | 1.105         | 1.105                    | 1.105                                   | 1.105                       | 1.105             | 1.105                      | 1.105                | 1.105            | 1.105                              | 1.105                      | 1.105                |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>1.305</b> | <b>1.153</b>  | <b>0.109</b>             | <b>0</b>                                | <b>0</b>                    | <b>0.074</b>      | <b>0.054</b>               | <b>0</b>             | <b>0</b>         | <b>0</b>                           | <b>0.012</b>               | <b>0</b>             |
| <b>Demand Savings</b>                                  |              |               |                          |                                         |                             |                   |                            |                      |                  |                                    |                            |                      |
| Unitary demand savings (kW)                            | 4.00         | 4.00          | 7.66                     | 7.66                                    | 7.66                        | 10.34             | 7.66                       | 10.34                | 7.57             | 47.53                              | 0.63                       | 0.63                 |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.572</b> | <b>0.552</b>  | <b>0.046</b>             | <b>0</b>                                | <b>0</b>                    | <b>0.031</b>      | <b>0.023</b>               | <b>0</b>             | <b>0</b>         | <b>0</b>                           | <b>0.001</b>               | <b>0</b>             |
| Line loss factor                                       | 1.105        | 1.105         | 1.105                    | 1.105                                   | 1.105                       | 1.105             | 1.105                      | 1.105                | 1.105            | 1.105                              | 1.105                      | 1.105                |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.632</b> | <b>0.610</b>  | <b>0.051</b>             | <b>0</b>                                | <b>0</b>                    | <b>0.034</b>      | <b>0.025</b>               | <b>0</b>             | <b>0</b>         | <b>0</b>                           | <b>0.001</b>               | <b>0</b>             |

## **4.3 NET-TO-GROSS RATIO**

The NTGR evaluation of the pilot is based on a self-report approach which relies on a series of questions designed to measure the influence of the pilot on customers' decisions to substitute electric heating or DHW systems with another source of energy. These questions were included in the participant survey.

This section presents the methodology used to transform responses to NTGR interview questions into a NTGR. For the pilot, the NTGR includes the assessment of two distortion effects: free-ridership and spillover. Once each effect is quantified, the NTGR is calculated based on the equation below:

$$\text{Net-to-gross ratio} = (1 - \% \text{ free-ridership} + \% \text{ spillover})$$

### **4.3.1 Free-Ridership**

Free-ridership can occur when participants declare that they would still have replaced or substituted their electric space heating or domestic hot water heater system in the absence of the pilot. The telephone survey included eight free-ridership questions divided into four groups that attempted to assess:

- > the probability that the customer would have purchased, replaced or substituted their electric systems with the same source of energy or system in the absence of the pilot;
- > the probability that the participant would have paid the full cost of the project in the absence of the pilot;
- > the factors, other than the pilot, that might have affected the customer's decision; and
- > the temporal sequence of the pilot and the customer's decision.

Each group of questions is transposed into a level of pilot attribution which is used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix VII.

The approach developed by Econoler to estimate the free-ridership level of the Fuel Substitution Pilot is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania by using:

- > A 0 to 10 scoring system.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced customer energy efficiency decision making. This question structure more accurately reflects the complex nature of the real-world decision making and helps ensure that all non-pilot influences are considered in the free-ridership assessment in addition to pilot influences.

Using this approach, survey results revealed a free-ridership level of 42 percent for the pilot. This high free-ridership level is justified by the fact that 21 of the 28 participants surveyed had already been flagged for free-ridership at the time of application to the pilot. The participants indicated in their application form that they would probably or definitively proceed with the equipment replacement even without a rebate. Moreover, half of the participants surveyed indicated that they had learned about the Fuel Substitution Pilot at the store where they purchased their new equipment. This is an indication that they were already strongly considering a retrofit even before knowing about the program.

The sample size for each category, except for pellet stoves, was not sufficient to establish a specific free-ridership level for each category that could be used for the evaluation. However, the values obtained for each category were used for comparison purposes. The free-ridership level was found to be particularly high for wood and pellet stoves (46 percent and 42 percent respectively), which is an indication that eligibility criteria for these two products could be enhanced. This could be done by establishing performance requirements. Moreover, the free-ridership level for the only participant surveyed who had a natural gas system installed is 12 percent. This level is significantly lower than the values obtained for other categories. The future program should aim at increasing the number of participants who install natural gas systems, despite the fact that few potential participants have access to the natural gas network compared to other energy sources.

#### **4.3.2 Spillover**

For the program, the internal spillover effects are measured through the participant survey, for participants who switched from electricity to natural gas. The proportion of participants who made such a switch is small; however, the goal was to identify additional electricity savings for this group of participants. Internal spillover can occur when participants who installed a natural gas heating system replace or substitute electric appliances with natural gas appliances, following or during their participation in the pilot due to its influence.

During the telephone survey, the participant who had installed a natural gas heating system was asked if any natural gas appliances were bought and installed during or following a previous participation in the pilot. This participant did not indicate having installed additional natural gas appliances following or during participation in the pilot. Thus, there is no spillover associated with the Fuel Substitution Pilot.

Based on the free-ridership and spillover levels obtained, the NTGR for the pilot is 0.58. The NTGR value was not broken down by type of equipment installed since the free-ridership values obtained through surveys were not broken down by category.

## 4.4 NET SAVINGS

Net savings for the pilot were estimated using the NTGR value obtained above. The equation below was used to calculate net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times \text{Net-to-gross ratio}$$

This equation was used for both demand and energy savings. The results obtained are presented in Table 20: Comparison of Tracked and Evaluated Savings at the Generator

|                           | Gross Savings    | NTGR        | Net Savings      |
|---------------------------|------------------|-------------|------------------|
| <b>Energy Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 2.741 GWh        | 0.47        | 1.300 GWh        |
| <b>Evaluation Results</b> | <b>2.707 GWh</b> | <b>0.58</b> | <b>1.570 GWh</b> |
| <b>Demand Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 1.371MW          | 0.47        | 0.641 MW         |
| <b>Evaluation Results</b> | <b>1.353 MW</b>  | <b>0.58</b> | <b>0.785 MW</b>  |

For 2011, the total net energy savings at the generator are estimated at 1.570 GWh while demand savings are estimated at 0.785 MW.

**Table 20: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Gross Savings    | NTGR        | Net Savings      |
|---------------------------|------------------|-------------|------------------|
| <b>Energy Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 2.741 GWh        | 0.47        | 1.300 GWh        |
| <b>Evaluation Results</b> | <b>2.707 GWh</b> | <b>0.58</b> | <b>1.570 GWh</b> |
| <b>Demand Savings</b>     |                  |             |                  |
| Tracked Savings from ENSC | 1.371MW          | 0.47        | 0.641 MW         |
| <b>Evaluation Results</b> | <b>1.353 MW</b>  | <b>0.58</b> | <b>0.785 MW</b>  |

The net energy values calculated were compared to the pilot tracked savings for 2011. The values calculated for the pilot are significantly higher than those calculated from the tracking sheet. This can be explained by the difference between the NTGR calculated for this evaluation and the one applied by the PM to tracked savings. The NTGR value in the tracked savings varied from 1 for natural gas



heating systems to as low as 0.23 for natural gas DHW systems compared to the 0.58 value calculated for the evaluation.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pilot Manual Content</b>   | <b>1. Document important program practices:</b> The table showing the different rebates for each option is well detailed in the pilot manual. However, for internal tracking and modification purposes, the source of calculation for each rebate should be documented in the manual, including the presumed costs participants have to pay for each measure.                                                                                                                                                                                                                                                                                                                                |
|                               | <b>2. Add information to the pre-approval application form for administrative purposes:</b> Econoler recommends that the pre-approval application form include an ID number. It should also include a revision date in case mid-course modifications are made to the pilot. Finally, beside the electric utility account number, the utility name should be identified.                                                                                                                                                                                                                                                                                                                      |
|                               | <b>3. Provide a “base case”:</b> The manual does not provide a “base case” that gives information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                          |
|                               | <b>4. Provide the parameters used to estimate the objectives:</b> After estimating the gross savings from the base case established in the manual, the objectives are then forecast in terms of net savings. To that effect, the objectives include any distortion effects, whether positive or negative. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The pilot manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the pilot objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |
| <b>Pilot Savings Tracking</b> | <b>5. Clearly define project status in the tracking sheet:</b> The tracking sheet provided includes all the applications submitted. Project status, whether completed or in progress, should be clearly defined to facilitate the selection of projects for which savings can be claimed.                                                                                                                                                                                                                                                                                                                                                                                                    |
|                               | <b>6. Collect details on heating and/or Domestic Hot Water (DHW) system capacity:</b> The tracking sheet does not present any information on the capacity of the old and new systems. Having this information on hand could help justify the savings allocated by the PM to the new measure implemented, especially in situations where values different from the prescriptive value are used.                                                                                                                                                                                                                                                                                               |

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pilot Design and Implementation</b> | <p><b>7. Develop an evaluation plan in parallel with program design and development:</b> This pilot has no evaluation plan. Econoler strongly recommends that for each new pilot or program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> |
|                                        | <p><b>8. Provide examples in the program brochure:</b> The collateral activities of the pilot include the publication and distribution of information in the form of a brochure. The Evaluator recommends including real implementation examples that illustrate the savings generated for switching. This could be accomplished once the participant number is sufficient to document such cases.</p>                                                                                                                                                                                                                                                                                                                                                                                              |
|                                        | <p><b>9. Consider partnering with a delivery agent and subcontractors in a near future:</b> The Evaluator notices that there are different fuel substitution scenarios and many rebates and conditions to be eligible for the pilot. For such a program, a delivery agent (DA) would be useful along with competent subcontractors in order to have a better control on program implementation. The DA could be involved once the program generates enough participants.</p>                                                                                                                                                                                                                                                                                                                        |
| <b>ENSC Website</b>                    | <p><b>10. Define acronyms:</b> Econoler noticed that in certain sections of the pilot page, acronyms are used without having been defined first. For instance, in the “Wood &amp; Pellet Furnaces or Boilers” section, the acronym WETT is found without being defined first. This should be corrected throughout for those who are not familiar with this acronym.</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Participant Perspectives</b>        | <p><b>11. Focus on energy bill savings in program communications:</b> Communications should emphasize to customers the opportunities to save on energy bills since it is by far the main motivation for participating in the pilot.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Impact Evaluation</b>               | <p><b>12. Investigate secondary heating system usage:</b> No correction factor was established based on the site visit results. However, the proportion of the total heating load provided by a secondary heating source before and after fuel substitution should be investigated. This will allow the identification of situations in which savings should be adjusted based on a high usage of the secondary heating source.</p>                                                                                                                                                                                                                                                                                                                                                                 |
|                                        | <p><b>13. Increase the number of participants who install natural gas systems:</b> The future program should be aimed at increasing the number of participants who install natural gas systems, despite the fact that few potential participants have access to the natural gas network compared to other energy sources.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## APPENDIX II - PROGRAM THEORY

| Fuel Substitution Pilot                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                           |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                           |
| #                                                                                              | Program Theory                                                                                                                                                                                                                                                                                                                                                                                            | Performance Indicators                                                                                                                                                                                                                                                    |
| 1                                                                                              | To promote the program, ENSC has a marketing strategy that includes market push and market pull activities with different communication media, different partners and numerous activities. With such an elaborate strategy, the program hopes to attract a significant number of participants. Analyses of the performance indicators will tell which strategy or strategies attracted more participants. | Pages 7 and 8 of the draft program manual list a comprehensive marketing strategy with 10 different activities. The performance indicators would be to keep records of all activities, material, attendances, dates, printed material, number of clicks by web site, etc. |
| 2                                                                                              | Subsidies are not given for just any equipment. The program makes sure that regardless of the fact that it is for natural gas, wood or pellets, the equipment has high efficiency standards.                                                                                                                                                                                                              | The list of minimum efficiency standards by equipment updated to follow market trends in case some levels of efficiency are raised.                                                                                                                                       |
| 3                                                                                              | Financial incentives have been established for each system based on recommendations from Dunskey Energy Consulting.                                                                                                                                                                                                                                                                                       | Keep track in a database of the standard equipment and installation rebates and their modifications, if any, along with the modification date.                                                                                                                            |
| 4                                                                                              | The program has two forms: a pre-approval application and a rebate application form. The first form is to confirm eligibility while the second form is for applicants to confirm that the system was installed and to apply for the rebates.                                                                                                                                                              | Information from both forms is entered in an Excel tracking sheet.                                                                                                                                                                                                        |
| 5                                                                                              | Heritage Gas (HG) is an important partner in this program. It offers an additional rebate for customers who wish to convert to natural gas.                                                                                                                                                                                                                                                               | There must be a link between ENSC and HG since no one can have a cumulative rebate that exceeds 100 percent of the total substitution cost.                                                                                                                               |

| <b>Fuel Substitution Program</b>                                                               |                                                                                                                                                                                                                                     |                                                                                                                                       |
|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                                                                                     |                                                                                                                                       |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                                                                                     |                                                                                                                                       |
| #                                                                                              | Program Theory                                                                                                                                                                                                                      | Performance Indicators                                                                                                                |
| 6                                                                                              | The marketing strategy attracts clients who are eligible to participate.                                                                                                                                                            | Identify from which source or marketing activity the participant was influenced to take part in the program.                          |
| 7                                                                                              | This activity allows ENSC to inspect randomly some installations (before or after installation) for control purposes.                                                                                                               | Short inspection report for each visit (with or without pictures).                                                                    |
| 8-9-10                                                                                         | Once the pre-approval application form is approved, the client proceeds with uninstalling the electrical system (if applicable) and proceeds with the acquisition, installation and inspection of the new energy system.            | For wood/pellet installation, a WETT certificate is mandatory for safety and efficiency purposes.                                     |
| 11                                                                                             | The Heritage Gas rebate contributes to increasing the number of conversions.                                                                                                                                                        | Data from Heritage Gas related to rebates given to the same client.                                                                   |
| 12                                                                                             | Switching from electricity to natural gas or wood/pellets represents important dollar savings for participants.                                                                                                                     | Tracking reduction in electricity consumption for evaluation purposes. The program's main objective is to reduce electric generation. |
| 13                                                                                             | Reducing electricity generation helps lower the need for a new fossil-fuel generation facility in Nova Scotia. Additionally, reducing electricity use produced primarily from coal and oil brings about a drop in greenhouse gases. | Tracking reduction of electricity with associated greenhouse gases from the reduction of oil or coal.                                 |
| 14                                                                                             | As a side benefit, wood and pellets are a local resource. Any increase in the use of this local resource contributes to raising the level of energy self-sufficiency of the province.                                               | Tracking share of wood and pellets in the province's energy profile.                                                                  |

## APPENDIX III - DEMOGRAPHICS

The majority of respondents reside in a detached single-family home (86%). Seven in 10 respondents have a home with three bedrooms (68%), and one in 10 have four or more bedrooms in their home (11%). Just under six in 10 (57%) respondents have two people in their household, while one-third (32%) have three or more people in their household.

**Table 21: Type of Residence**

| Type of Residence             | 2011 |
|-------------------------------|------|
| <i>Sample Size</i>            | 28   |
| Detached single-family home   | 86%  |
| Mobile home or house trailer  | 14   |
| Number of Bedrooms            | 2011 |
| <i>Sample Size</i>            | 28   |
| 1                             | 4%   |
| 2                             | 18   |
| 3                             | 68   |
| 4+                            | 11   |
| Number of people in household | 2011 |
| <i>Sample Size</i>            | 28   |
| 1                             | 11%  |
| 2                             | 57   |
| 3                             | 14   |
| 4+                            | 18   |

All respondents reside in their home year round.

**Table 22: Home Occupancy**

| Home Occupancy     | 2011 |
|--------------------|------|
| <i>Sample Size</i> | 28   |
| Year Round         | 100% |

Three in 10 respondents are between the ages of 25 and 34 (29%), and one-third are 55 years of age or older (35%). In terms of education, six in 10 have a college (21%) or university (39%) degree.

**Table 23: Age and Education**

| <b>Age</b>                                                    | <b>2011</b> |
|---------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                            | <i>28</i>   |
| 18-24                                                         | --          |
| 25-34                                                         | 29%         |
| 35-44                                                         | 14          |
| 45-54                                                         | 21          |
| 55-64                                                         | 21          |
| 65+                                                           | 14          |
| <b>Education</b>                                              | <b>2011</b> |
| <i>Sample Size</i>                                            | <i>28</i>   |
| Less than high school graduation certificate                  | 11%         |
| High school graduation certificate and/or some post-secondary | 21          |
| Trade certificate                                             | --          |
| College certificate or diploma                                | 21          |
| University certificate or diploma                             | 39          |
| Other                                                         | 7           |

About three out of five respondents have an annual household income of \$50,000 or more (61%).

**Table 24: Income**

| <b>Income</b>      | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | <i>28</i>   |
| Less than \$15,000 | --          |
| \$15,000-\$24,999  | --          |
| \$25,000-\$34,999  | 14%         |
| \$35,000-\$49,000  | 18          |
| \$50,000-\$69,000  | 25          |
| \$70,000-\$79,000  | 11          |
| \$80,000 or more   | 25          |
| Refused            | 7           |

Just under six in 10 respondents are male (57%), while over four in 10 are female (43%).

**Table 25: Gender**

| <b>Gender</b>      | <b>2011</b> |
|--------------------|-------------|
| <i>Sample Size</i> | 28          |
| Male               | 57%         |
| Female             | 43          |



## **APPENDIX IV - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Fuel Substitution Pilot (New Program)**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                      |
|--------------------------------------|
| <b>Source: Brochure from the Web</b> |
|--------------------------------------|

C: The brochure seems complete and clear.

Q: Is the level of utilization of wood pellets as a partial substitution to electricity a concern to ENSC?  
What were your assumptions in that regard?

|                         |
|-------------------------|
| <b>Source: Web Site</b> |
|-------------------------|

#### **Fuel Substitution Pilot Program**

Q: How do you dispose of the removed equipment?

How to participate

C: A process flow chart is always very useful to the participant and the program partners

C: WETT could be in full letters

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

#### **Page 5**

Q: We notice that natural gas equipment have no capacity specified. Care to comment?

Q: The incentives have been calculated based on what exactly: uninstalling, acquisition, installation and inspection?

Q: Does it cover a % of the total cost? Does the participant have to pay part of it?

#### **Page 7**

C: The program marketing strategy seems comprehensive.

Q: Do you intend to collect PI for all these activities?

Q: Collateral: I am not familiar with that word. Is that a kind of example or demonstration of substitution in situ with the benefits related to it?

#### **Page 9**

Q: We understand that the detail calculations for the energy and demand savings will be available for the evaluator in case there are some adjustments to the savings based on a different reality than what was presumed?

Q: The program procedure could be divided in two sections, one for the participants and one for internal use of ENSC (that does not concern the participant). Also a process flow chart could be useful for the participant and partners. Care to comment?

#### **Pre-Approval Application Form**

Q: Is there only one utility involved in this program? Because you don't ask the utility name

Q: Item # 7: What happens if the homeowner checks the "definitely" answer?

C: This form needs a revision date beside its name.

#### **Page (Overall Program Eligibility)**

Q: 10<sup>th</sup> point: about receiving more incentives than the total cost. How do you verify this? And what happens if you have such a case?

Rebate Application form: This form needs a revision date.

C: The logic model was developed by the evaluator and commented by the program manager.

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Could you please describe the program partners and their specific roles so we can develop appropriate process evaluation question for them.

C: The program justification is clear

C: The program theory is with the logic model

Q: Was there any assumptions for distortion effects (free-riders, P spillover, etc.). If yes on what were they based?

Q: Are there any known barrier to that program?

Q: Are you planning to redo the cost effectiveness test after the evaluation?

Q: That particular program has an important harmful emission reduction, do you use the social cost test for it or is it still the TRCT that you use?

Q: While designing that program, was there any evaluation plan designed with it?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database? (1 is very difficult 10 is very easy)

Q: Do you have any other subject you wish us to investigate with the program partners who will be part of the process evaluation?

Thank you very much.

## **APPENDIX V - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

### **Fuel Substitution Pilot**

October 22, 2011

### **SCREENING QUESTIONS**

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

### **INTRODUCTION**

Hello, my name is \_\_\_\_\_ from CRA (Corporate Research Associates). I am calling on behalf of the Fuel Substitution Pilot Program from Efficiency Nova Scotia Corporation (ENSC).

We are calling customers who used the program to substitute their electric space heating with another heating source such as a wood or pellet stove, or to completely remove electric space heating or domestic water heating from the home and replacing their systems with a new heating source in 2011. Are you the person in your household who was most involved and familiar with deciding about the program?

[IF NO, ASK TO SPEAK TO THE APPROPRIATE PERSON: "May I please speak to the person who knows the most about the heating system in your house?"]

[IF APPROPRIATE PERSON] We are trying to get feedback from customers about the Fuel Substitution Pilot Program to make the program better. Your responses will be kept strictly confidential—that is, your name will not be associated with any of your responses. This survey will take about 15 minutes of your time.

- V1. Our records indicate that your household participated in the Fuel Substitution Program. Is this correct?
1. Yes [CONTINUE]
  2. No, does not recall participating [PROBE: “Are you sure? According to our records, you would have received a rebate from Efficiency Nova Scotia for switching from electricity to a new energy source for space heating or domestic water heating or for installing new space heating or domestic water heating equipment.”] [IF PERSIST AS NO, THANK, TERMINATE AND RECORD]
  9. (Don’t know/Refused) [PROBE: “Are you the person who knows the most about the heating system in your house or your household participation to the Fuel Substitution/Switching Program?”] [IF NO, ASK TO SPEAK TO THE APPROPRIATE PERSON AND RESTART AT INTRODUCTION. IF PERSISTS AS NO, THANK, TERMINATE AND RECORD.]

#### **Program Notoriety and Participation [P series]**

- P1. How did you learn about the Fuel Substitution Program? PROBE: Anything else? (DON'T READ; ALLOW MULTIPLE RESPONSES)
1. (Mailing from Heritage Gas)
  2. (Email from Heritage Gas)
  3. (On the Heritage Gas website)
  4. (Mailing from Efficiency Nova Scotia)
  5. (Email from Efficiency Nova Scotia)
  6. (On the Efficiency Nova Scotia website)
  7. (Mailing from ViewPoint.ca)
  8. (Email from ViewPoint.ca)
  9. (On the ViewPoint.ca website)
  10. (At the Ideal Homeshow)
  11. (At a Homeshow not specified)
  12. (Through the Nova Scotia Homebuilder Association)
  13. (Internet—unspecified)
  14. (Print brochure)
  15. (Co-worker, family, friend or word of mouth)
  16. (The store where you purchased your new equipment)
  96. (Other [SPECIFY \_\_\_\_\_])
  98. (Don’t know)
  99. (Refused)

- P2. Now I'm going to ask you to think back to when you decided to supplement your electric space heating or completely replace it with another heating source or system and participate in the Fuel Substitution Program. What was the SINGLE most important reason you were interested in switching heating system or substituting heating source? [DO NOT READ]
1. (To save on energy costs/bills)
  2. (For better comfort)
  3. (To make home heating more efficient)
  4. (To help the environment)
  96. (Other) [SPECIFY \_\_\_\_\_]
  98. (Don't know) [GO TO P4]
  99. (Refused) [GO TO P4]
- P3. Were there any other reasons? [SAME LIST AS IN P2] [DO NOT READ. ACCEPT MULTIPLE RESPONSES]
- P4. Before participating, did you have any concerns about taking part in the program?
1. (Yes)
  2. (No)
  98. (Don't know)
  99. (Refused)
- P5. [IF P4 = 1] What were those concerns? PROBE: Anything else? [DO NOT READ. ACCEPT ALL RESPONSES]
1. (That the new heating system would be inefficient)
  2. (That improvements would cost a lot)
  3. (Rebates would be too low / insufficient)
  4. (Wouldn't like what I installed)
  5. (The process would take too long)
  6. (My insurance would increase)
  96. (Other) [SPECIFY \_\_\_\_\_]
  98. Don't know
  99. Refused

**Program Satisfaction [S series]**

- S1. Using a scale from 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how would you rate your satisfaction with the Fuel Substitution Program OVERALL? [DO NOT ACCEPT A RANGE - RECORD NUMBER, 98 = Don't know/Don't recall, 99 = Refused]
- S2. [IF S1 = 1 or 2] You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were not satisfied with the program overall? [PROBE FOR SPECIFIC REASON. DO NOT READ. ACCEPT ONE RESPONSE]
1. (Too difficult to complete the pre-approval application form)
  2. (Too long to get the pre-approval)
  3. (Program too hard to understand – too many conditions)
  4. (The incentive amount (rebate) is too small)
  5. (The rebate application form is too complicated to complete)
  6. (There are too many documents to submit along with the rebate application form)
  7. (It is too long to receive the incentive amount (rebate))
  8. (There are too many verifications from Efficiency Nova Scotia)
  96. (Other, [specify: \_\_\_\_\_])
  98. (Don't know)
  99. (Refused)
- S3. [IF S1 = 1 or 2] Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE; SAME LIST AS S2]
- S4. Now I'm going to ask you to think about each aspect of the Fuel Substitution Program. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how satisfied were you with each aspect of the Fuel Substitution Program? If you did not have experience with one of the aspects please tell me. [DO NOT RANDOMIZE] [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused]
- a) Program application, forms and associated paperwork
  - b) Interaction and communication with Efficiency Nova Scotia staff
  - c) Easiness to understand information about the program
  - d) Initial confirmation of eligibility
  - e) Rebate or incentive amounts
  - f) Time required to receive rebate or incentive
  - g) The system installed in your home

**Free-ridership [FR series]**

FR1. Had you **already** considered replacing or substituting your space heating or domestic hot water system with another heating source **before** you heard about the Fuel Substitution Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[IF FR1=YES]**

FR1a. **Before** you decided to participate in the Fuel Substitution Program, had you already made the decision to replace or substitute your space heating or domestic hot water system with another heating source?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Fuel Substitution Program.

If you had not participated in the Fuel Substitution Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely **Would Not** Have Taken the Action," and a 10 indicating that you "Definitely **Would Have** Taken the Action." AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: "AND NEXT, In the absence of the Program, would you have . . . : DO NOT ACCEPT A RANGE – ASK FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. ....replaced or substituted your space heating or domestic hot water system with one that did not use electricity?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused



FR2b. ...replaced or substituted your old space heating or domestic hot water system with another one that uses electricity?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2c. ...replaced or substituted your space heating or domestic hot water system with one that did not use electricity , *but at a later date*?

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT ASK FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your response to a previous question that if the Fuel Substitution Program had not been available there was an X in 10 likelihood that you would have replaced or substituted your space heating or domestic hot water system with one that did not use electricity, *but at a later date*. Approximately how many months later would you have replaced or substituted your heating or domestic hot water system? **DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE**

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
97. (Don't Know)
98. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3. Efficiency Nova Scotia paid you \$[ACTUAL REBATE] for your new space heating or domestic hot water system. If you had not received the rebate from Efficiency Nova Scotia, would you have made the same purchase? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not Have**” and a 10 indicating that you “Definitely **Would Have**.”  
 PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_\_ Response                      \_\_\_\_98 Don't Know      \_\_\_\_99 Refused

FR4. Next, I'm going to ask you to rate the importance of the Fuel Substitution Program as well as other factors that might have influenced your decision to replace or substitute your space heating or domestic hot water system to another heating source. Using a scale from 0 to 10, where 0 means “Not at all important” and 10 means “Extremely important”, please rate the importance of each of the following in your decision to replace your heating system to another heating source.

| Factor<br>(READ AND RANDOMIZE)                                                                        | Responses – DO NOT ACCEPT A RANGE                    |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| a. The program rebate                                                                                 | ____ Response    ____98 Don't Know    ____99 Refused |
| b. Information or advice provided by the program                                                      | ____ Response    ____98 Don't Know    ____99 Refused |
| c. Previous experience with a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ____ Response    ____98 Don't Know    ____99 Refused |

**Spillover [SP series]**

**[ASK IF, IN DATABASE, APPLYING FOR REBATES = NG COMBO BOILER OR GAS COMBO]**

SO1. Now I'd like you to think about the time you participated in the Fuel Substitution Program to convert your heating system to gas. While or after converting your heating system to gas, did you convert additional equipment to gas? It could be your stove, your clothes dryer, or other kitchen appliance...

1. Yes
2. No (GO TO SM1)
98. (Don't know) (GO TO SM1)
99. (Refused) (GO TO SM1)

**[IF SO1 = 1]**

SO2. What additional equipment did you convert to gas while or after converting your heating system to gas? PROBE: Anything else? [PROBE FOR SPECIFIC EQUIPMENT. DO NOT READ. ACCEPT MULTIPLE; 98 = DK, 99 = REFUSED]

1. (Stove)
2. (Clothes dryer)
3. (Other kitchen appliance)
96. (Other, specify \_\_\_\_\_)
98. (Don't know)
99. (Refused)

**SO3. [IF SO1 = 1]**

When did you decide to convert these equipment to gas? Was it...

**READ RESPONSES IN ORDER – ALLOW MULTIPLE RESPONSES**

1. Before deciding to participate in the Fuel Substitution Program
2. When deciding to participate in the Fuel Substitution Program
3. After deciding to participate in the Fuel Substitution Program
98. DO NOT READ (Don't know)
99. DO NOT READ (Refused)

SO4. [IF SO1 = 1]

Before participating in the Fuel Substitution Program, was your house connected to the gas utility network?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**Effects of the energy conservation measures on their energy bills [SM series]**

SM1. Since this new equipment was installed under the program, what changes, if any, have you noticed in your energy bills? Have ... READ STATEMENTS IN ORDER - RECORD ONE RESPONSE

- 1. Your bills gone down
- 2. Your bills gone up, or
- 3. Has there been no change in your bills  
VOLUNTEERED
- 4. (It is too soon to tell)
- 98. (Don't know)
- 99. (Refusal)

**Impact of measures [IM series]**

IM1. Please indicate how each of the following has changed since participating in the Fuel Substitution Program? On a scale of 1 to 5, where 1 means "no improvement" and 5 means a "considerable improvement", how much has [READ EACH ONE] improved?

- a. Your interest in Energy efficiency
- b. Your knowledge of Energy efficiency

**Barriers to action [B series]**

B1. Were there any challenges or barriers that you faced in implementing the new equipment or the new energy source rebated by the Fuel Substitution Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

B2. [If B1 = 1 "Yes"] What was the SINGLE most important challenge or barrier? **(DO NOT READ - ACCEPT ONE RESPONSE)**

- 1. (Concern that actual bill savings would be less than estimated)
- 2. (Lack of information to make an informed decision)
- 3. (Rebate/incentive was too little)
- 4. (Paperwork/process required too much work)
- 5. (Too little information about the program)
- 6. (Cost savings not worth the effort of applying)
- 7. (Approval takes too long)
- 8. (Lack of financing)
- 9. (Energy efficient equipment does not meet payback requirements)
- 10. (Lack of technical knowledge)
- 96. (Other barrier [**Specify:** \_\_\_\_\_])
- 98. (Don't know) [GO TO VP SERIES]
- 99. (Refused) [GO TO VP SERIES]

B3. [If B1 = 1 "Yes"] What was the SECOND most important barrier? **(DO NOT READ - ACCEPT ONE RESPONSE – SAME LIST AS B2)**

**Value of the program to customers [VP series]**

VP1. Would you recommend the Fuel Substitution Program to a family member or friend?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

VP2. [IF VP1 = 2 "NO"] Why not? [**DO NOT READ – multiple responses**]

1. (Is not worth the expenses)
2. (No family members or friends that could be eligible)
3. (Concern that actual bill savings would be less than estimated)
4. (Lack of information to make an informed decision)
5. (Incentive is too small)
6. (Energy efficient equipment does not meet payback requirements)
96. (Other [**Specify:** \_\_\_\_\_])
98. (Don't know/Don't recall)
99. (Refused)

### **RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS [R SERIES]**

R1. Do you have any recommendations for improving the Fuel Substitution Program? Probe: Anything else? [**DO NOT READ. ACCEPT MULTIPLE**]

1. (Offer more products/measures eligible to rebates)
2. (Offer more information on the products/measures recommended)
3. (Simplify program application, forms and associated paperwork)
4. (Increase the rebate amount)
5. (Increase the delay given to complete the upgrades)
6. (Improve communication)
7. (Advertise the program more or in a better way)
8. (No recommendation)
96. (Other [**SPECIFY** \_\_\_\_\_])
98. (Don't know)
99. (Refused)

R2. Would a figure illustrating the various steps to follow in order to participate in the Fuel Substitution Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?

1. \_\_\_ Significantly
2. \_\_\_ Somewhat
3. \_\_\_ Slightly
4. \_\_\_ Not at all
96. (Depends on what the figure or illustration would have been)
97. (This kind of document already exists)
98. (Don't know)
99. (Refused)

**DEMOGRAPHICS [D SERIES]**

[ASK ALL RESPONDENTS]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-7, then 8; SELECT ONE RESPONSE]

- 1. Detached single-family home
- 2. Semi-detached house
- 3. Mobile home or house trailer
- 4. Townhouse or duplex which share adjacent walls
- 5. Row house (Single story apartment building)
- 96. Other [SPECIFY: \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

D2. How many bedrooms are in your home? [98=DK; Enter zero for a studio apartment with no bedrooms]

D5. Is your home occupied year round, or is it a seasonal home?

- 1. Year round residence
- 2. Seasonal / vacation home
- 96. (Other Specify \_\_\_\_\_)
- 98. (Don't Know)
- 99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

**[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]**

D7. What is your age group? Are you... [READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
9. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation certificate)
2. (High school graduation certificate and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University certificate or diploma)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
7. \$80,000 or more
99. (Refused)

D10. **[DO NOT READ]** Gender

1. Male
2. Female

**[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK AND TERMINATE.]**



## APPENDIX VI - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Econoler site number \_\_\_\_\_

Site contact Name: \_\_\_\_\_

Person met during site visit: \_\_\_\_\_

ENSC Project #: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

### 2 MEASURES INFORMATION

| Home heating system                                                                                                                                    |               |                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------|
|                                                                                                                                                        | From database | Contact declaration |
| Date of installation:                                                                                                                                  | _____         | _____               |
| Main energy source for heating before conversion and % of total heating of the building envelope provided ( <i>electric, natural gas, etc.</i> ):      | _____         | _____               |
| Type – Main heating system type before conversion ( <i>boiler, heat pump, resistive heating, etc.</i> ):                                               | _____         | _____               |
| Capacity – Main heating system before conversion ( <i>ask the contact if they still have the equipment or some documentation</i> ):                    | _____         | _____               |
| AFUE – Main heating system before conversion ( <i>ask the contact if they still have the equipment or some documentation</i> ):                        | _____         | _____               |
| Secondary energy source for heating before conversion and % of total heating of the building envelope provided ( <i>electric, natural gas, etc.</i> ): | _____         | _____               |

| Home heating system                                                                                                                          |               |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------|
|                                                                                                                                              | From database | Contact declaration |
| Type – Secondary heating system type before conversion ( <i>boiler, heat pump, resistive heating, etc.</i> ):                                | <hr/>         | <hr/>               |
| Capacity – Secondary heating system before conversion ( <i>ask the contact if they still have the equipment or some documentation</i> ):     | <hr/>         | <hr/>               |
| AFUE – Secondary heating system before conversion ( <i>ask the contact if they still have the equipment or some documentation</i> ):         | <hr/>         | <hr/>               |
|                                                                                                                                              | From database | Site validation     |
| Energy source for new equipment used for heating and % of total heating of the building envelope provided ( <i>wood, natural gas, etc.</i> ) | <hr/>         | <hr/>               |
| Type – New heating system installed ( <i>boiler, furnace, etc.</i> )                                                                         | <hr/>         | <hr/>               |
| AFUE – New heating system installed                                                                                                          | <hr/>         | <hr/>               |
| Model name/number - New heating system installed                                                                                             | <hr/>         | <hr/>               |
| Is the equipment ENERGY STAR® certified (YES/NO)?                                                                                            | <hr/>         | <hr/>               |
| Is electric back-up still in use? If yes, what is the % usage?                                                                               | <hr/>         | <hr/>               |

### Water heating system

|                                                                                                         | From database | Contact declaration |
|---------------------------------------------------------------------------------------------------------|---------------|---------------------|
| Date of installation:                                                                                   | <hr/>         | <hr/>               |
| Was this system replaced during the fuel substitution (YES/NO)?                                         | <hr/>         | <hr/>               |
| Energy source used for water heating before conversion ( <i>electric, natural gas, etc.</i> ):          | <hr/>         | <hr/>               |
| Type – Water heating system before conversion ( <i>boiler, heat pump, etc.</i> ):                       | <hr/>         | <hr/>               |
| Energy factor – Water heating system before conversion:                                                 | <hr/>         | <hr/>               |
| Energy source installed for water heating, after conversion ( <i>wood, natural gas, etc.</i> ):         | <hr/>         | <hr/>               |
| Type – Water heating system installed and efficiency after conversion ( <i>boiler, furnace, etc.</i> ): | <hr/>         | <hr/>               |
| Model name/number of heating system installed:                                                          | <hr/>         | <hr/>               |
| Is the equipment ENERGY STAR® certified (YES/NO)?                                                       | <hr/>         | <hr/>               |

## APPENDIX VII – ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Fuel Substitution Pilot. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, had you already considered replacing or substituting your space heating or domestic hot water system with another heating source ?                                                                                                                                                                                | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just want to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to replace or substitute your space heating or domestic hot water system with another heating source?                                                                                                                           | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have replaced or substituted your space heating or domestic hot water system with one that did not use electricity? (Scale 0 to 10)                                                                                                                                              | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, would you have replaced or substituted your old space heating or domestic hot water system with another one that uses electricity? (Scale 0 to 10)                                                                                                                                                                     | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                                  | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)</b>                                                                                                                                          |
| <b>FR3.</b> If you had not received the rebate from ENSC, would you have made the same purchase of a new space heating or domestic hot water system ? (Scale 0 to 10)                                                                                                                                                                                              | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                                  | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3</b>                                                                                                                             |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c = Program factors                                                                                                                                                                                                                                                                                | FR4_P = MAX(a; b; c)                                                                                                                                                             |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                                  | <b>(10 - FR4_P) x 10%</b>                                                                                                                                                        |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have replaced or substituted your heating system with one that did not use electricity <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                               | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have made the replacement or the substitution?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                                  | <b>FR2cc</b>                                                                                                                                                                     |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                                        | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                |

Subsequently, the final free-ridership level calculated for each participant was submitted to two inconsistency tests:

- > The first inconsistency test consisted in verifying if  $(FR2a - FR2b) \geq 30\%$ . In that case, the participant's answers to FR2a and FR2b represented an inconsistency and PA1 became equal to the smallest value between FR2a and FR2b. Otherwise, PA1 remained unchanged.
- > The second inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to FR3 represented an inconsistency and PA2 was removed from the final free-ridership calculation. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.





# **LOW INCOME PROGRAM IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 22, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Low Income program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM), an outreach agent (OA) and three delivery agents (DAs), on three on-site visits as well as on a telephone survey of 70 program participants.

## **PROGRAM OVERVIEW**

The Low Income program aims at facilitating the implementation of cost-effective electrical energy-saving measures in residential low-income customer-owned households all across Nova Scotia by providing incentives to homeowners. Two categories of energy efficiency measures are offered through the Low Income program: Scope I and Scope II measures.

Scope I measures include mainly building envelope measures such as air sealing as well as insulating basements, crawl spaces, walls and attics. Ventilation fans in bathrooms and programmable thermostats are installed on a case-by-case basis, if deemed necessary. Scope I measures are funded by electricity ratepayers in electrically heated homes and by Provincial funds in non-electrically heated homes.

Scope II measures include compact fluorescent lamps (CFLs), hot water tank and pipe insulation, low-flow showerheads, faucet aerators, power bars and electric kettles. The replacement of eligible freezers and refrigerators with ENERGY STAR<sup>®</sup>-qualified models is also offered. These measures are funded by electricity ratepayers. Water heating improvements can also be offered as part of Scope II measures. They are funded by electricity ratepayers when the home has electric hot water and by provincial funds when the home has non-electric hot water.

Moreover, from mid-July to the end of August 2011, the Low Income program conducted a pilot project in two First Nations communities of Nova Scotia where participants received direct installation of energy-efficient products.

Through the Low Income program, Efficiency Nova Scotia Corporation (ENSC) collaborates with the Nova Scotia Department of Community Services (DCS), Service Nova Scotia and Municipal Relations (SNSMR) and program outreach agents (OAs) to qualify low-income participants based on specific income and home ownership criteria. DAs also operate under the program to conduct the initial energy audit that assesses the measures to be implemented as well the final audit that confirms the measures implemented and provides an EnerGuide rating.

The Low Income program aimed at achieving net electricity savings of 4.70 GWh and demand savings of 1.00 MW for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the Low Income program demonstrated that the program has a good potential for success and that it is essential to ENSC's program portfolio considering that it targets customers who do not have the financial resources to implement energy efficiency measures. The program totalled 5,103 participants for the year 2011, which represents a significant increase in comparison to 2010 (645 participants). In terms of net energy savings, the program generated 7.636 GWh compared to 0.895 GWh in 2010.

### **Program Barriers**

All program partners interviewed reported the confusion among consumers created by the many name changes undergone by the program since its launch. According to program partners, participants are confused between the different names used for the program: the Residential Energy Affordability Program (REAP) and the Low Income program. Since marketing research conducted by Nova Scotia Power Inc. (NSPI) indicated that the "Low Income Program" name was best suited for the program, efforts will have to be put forth to eliminate all confusion in the market.

Program partners identified the main barrier to the program as being the enrolment of participants. It is to be noted though that the new program delivery model implemented at the end of the year 2011 should solve the enrolment issue brought up by the partners. Indeed, through this new delivery model, direct installs are first offered to participants. Then, during the direct install, the DA conducts an initial audit and notes which customers could be potential participants for Scope I upgrades. This approach should result in a higher number of participants.

### **Satisfaction**

Satisfaction towards the program is very high among participants. Indeed, most participants expressed their satisfaction with the overall program and its various aspects. High satisfaction ratings were provided relative to the energy audits and their components. Moreover, all participants mentioned that they would recommend the program to a friend or a family member. Program partners also reported being very satisfied with the overall program as well as with their relationship with ENSC's team.

### **Program Energy Savings**

To calculate the net savings of the Low Income program in 2011, Econoler reviewed the gross savings using two features, namely the savings per EnerGuide point increase and the savings generated in relation with the implementation of a series of prescriptive measures. An initial methodology using a billing analysis was planned, but after a preliminary analysis of the participant database, Econoler

concluded that it was not possible since the number of participants who met the requirements were too low.

Due to the nature of the products offered in the Low Income program and the target customers, the distortion effects of the program were assumed to be insignificant. Consequently, the net-to-gross ratio (NTGR) for this program was assumed to be 1.

Using the revised unitary savings values, the interactive effects factors and the NTGR, the evaluation revealed that the Low Income program had generated net energy savings of 7.636 GWh and demand savings of 1.632 MW at the generator in 2011.

**Table 1: Comparison of Tracked and Evaluated Savings at the Generator for 2011**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 7.082 GWh             | 7.082 GWh                              | 1.00        | 7.082 GWh        |
| <b>Evaluation Results</b> | <b>8.163 GWh</b>      | <b>7.636 GWh</b>                       | <b>1.00</b> | <b>7.636 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 1.513 MW              | 1.513 MW                               | 1.00        | 1.513 MW         |
| <b>Evaluation Results</b> | <b>1.744 MW</b>       | <b>1.632 MW</b>                        | <b>1.00</b> | <b>1.632 MW</b>  |

These net evaluated savings were slightly higher than those tracked by ENSC by approximately 8 percent for the net energy and demand savings. The main reason for this difference is that the Evaluator adjusted the initial gross savings upwards as a result of a number of modifications to prescriptive measure savings. Among all the prescriptive measures included in this program, the adjustments to the unitary savings of lighting products (CFLs and LEDs), programmable thermostats and low-flow fittings (faucet aerators and low-flow showerheads) are those that had the most relevant impact on overall gross energy and demand savings. As a result, the evaluated gross savings found were approximately 15 percent higher than those tracked by ENSC. Nevertheless, the additions of interactive effects for lighting and domestic hot water heating measures reduced the difference between the evaluated and tracked savings by half.

In more detail, the table below presents the tracked and adjusted unitary savings values used for the calculation of the savings achieved thanks to the prescriptive measures implemented through the program and the related pilot project.

**Table 2: 2011 Program Unitary Savings Adjustments**

| Products                              | Unitary Savings Values (kWh/year) |           |
|---------------------------------------|-----------------------------------|-----------|
|                                       | Tracked                           | Evaluated |
| 13 W CFLs                             | 41                                | 46.3      |
| 23 W CFLs                             | 41                                | 69.5      |
| Specialty CFLs                        | 41                                | 49.8      |
| Flush-Mount CFLs and CFL Porch Lights | 34                                | 49.8      |
| CFL Torchieres                        | 241                               | 69.5      |
| LED Nightlights                       | 13                                | 29.3      |
| Programmable Thermostats              | 63.15                             | 221       |
| Electric Kettles                      | 49                                | 49        |
| Power Bars with Integrated Timer      | 53                                | 53        |
| Dehumidifier Replacements             | 108                               | 686       |
| New Dehumidifiers                     | -1000                             | 0         |
| Refrigerator Replacements             | 850                               | 817       |
| Freezer Replacements                  | 557                               | 637       |
| Refrigerator Retirements              | 776                               | 1,016     |
| Freezer Retirements                   | 705                               | 1,274     |
| Faucet Aerators                       | 86                                | 176.3     |
| Low-Flow Showerheads                  | 157                               | 377       |
| Hot Water Heater Pipe Insulation      | 74                                | 74        |
| Hot Water Heater Tank Wraps           | 399                               | 270       |

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a very satisfactory level in terms of program participation and energy savings. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the program:

- LI-R1. Assess the installation rate of certain prescriptive measures:** In 2011, the savings related to the increase of EnerGuide points accounted for only 13 percent of total program energy savings, the remaining proportion being due to the prescriptive measures or the energy efficiency products directly installed on site (including those installed through the First Nation pilot project). With this in mind, Econoler believes that on-site visits aiming at validating the installation rate of the Direct Install products should be performed under future project evaluations.
- LI-R2. Review HOT2000 models on a random basis:** The Evaluator or the PM should review a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.
- LI-R3. Ensure the final audits are completed after the implementation of measures:** In the 2011 final tracking sheet, the vast majority of projects had not yet had their final audit completed. ENSC explained that this situation was exceptional. Indeed, the fact that the Federal Government came back into EnerGuide and the Team Buy Initiatives organized for the EnerGuide for Existing Houses (EEH) program caused an increase in the number of participants in 2011 for both Low Income and EEH programs. As a result, the auditors became very busy in performing initial audits and important delays occurred for the completion of final audits. For these projects, ENSC used the projected E EnerGuide rating and a realization rate of 75 percent to calculate the savings related to the increase of EnerGuide point, which should normally only be used as a temporary estimate. ENSC should ensure that the DAs have sufficient staff and a protocol in place that would allow ensuring that all final audits are completed within a short period after the measures are implemented.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Low Income program is aimed at facilitating the implementation of cost-effective electrical-saving measures in residential low-income customer-owned households across Nova Scotia. It was first launched by Conserve Nova Scotia under the name Residential Energy Affordability Program (REAP). It is now marketed under the Low Income name and is fully administered and managed by ENSC.

The Nova Scotia Department of Community Services (DCS), Service Nova Scotia and Municipal Relations (SNSMR) and program outreach agents (OAs) are in charge of qualifying low-income individuals for participation. To be recruited for the program, homeowners must meet specific income and home ownership criteria.

Three delivery agents (DAs) operate across Nova Scotia to perform an initial energy audit in order to identify applicable measures to be implemented for each home. They also conduct a final audit to assess the measures implemented and provide an EnerGuide rating. The program is broken down into two categories of energy efficiency measures: Scope I and Scope II.

Scope I includes mainly building envelope measures such as air sealing as well as insulating basements, crawl spaces, walls and attics, if required. Ventilation fans in bathrooms and programmable thermostats are installed on a case-by-case basis if deemed necessary. Scope I measures are funded by electricity ratepayers in electrically heated homes and by provincial funds in non-electrically heated homes. If the home has electric and non-electric heating, the incentive funded by electricity ratepayers is proportional to the estimated use of electric space heating. When the home has multiple fuel sources, the DA will estimate, after talking with the homeowner, the percentage of heating supplied by each fuel source.

Scope II covers the implementation of measures such as various types of compact fluorescent lamps (CFLs), light-emitting diode (LED) nightlights, electric kettles, power bars with integrated timer, faucet aerators, low-flow showerheads as well as hot water tank and pipe insulation. Through this scope, eligible appliances can also be either replaced with ENERGY STAR<sup>®</sup>-qualified models or retired from the market in exchange for incentives. These measures are usually funded by electricity ratepayers. When the home has non-electric hot water, the water heating measures offered in Scope II (i.e., hot water tank and pipe insulation, low-flow showerheads and faucet aerators) are, however, directly funded by provincial funds.

Moreover, from mid-July to the end of August 2011, the Low Income program conducted a pilot project in two First Nations communities of Nova Scotia where participants received direct installation of energy-efficient products. These products included energy-efficient lights (13 and 23 watt CFLs), electric kettles, power bars with integrated timer as well as several measures to improve domestic hot water systems (faucet aerators, low-flow showerheads, hot water tank and pipe insulation). The



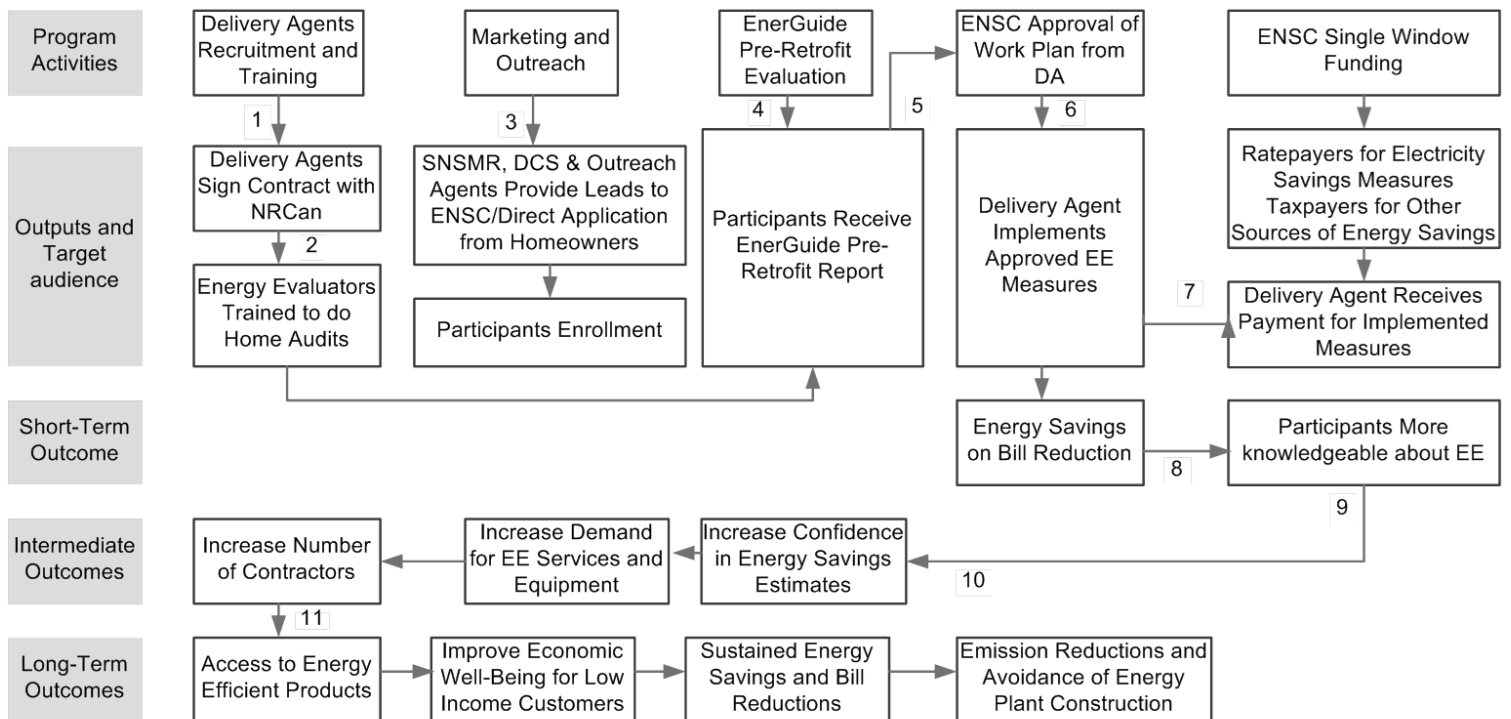
savings resulting from this pilot project were claimed with the savings of the Low Income program in the impact evaluation.

In 2011, the program had a net energy savings goal of 4.70 GWh and 1.00 MW for demand savings. In 2010, the Low Income program generated net energy savings of 0.895 GWh.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market<sup>1</sup>.

**Figure 1: Low Income Program Logic Model**



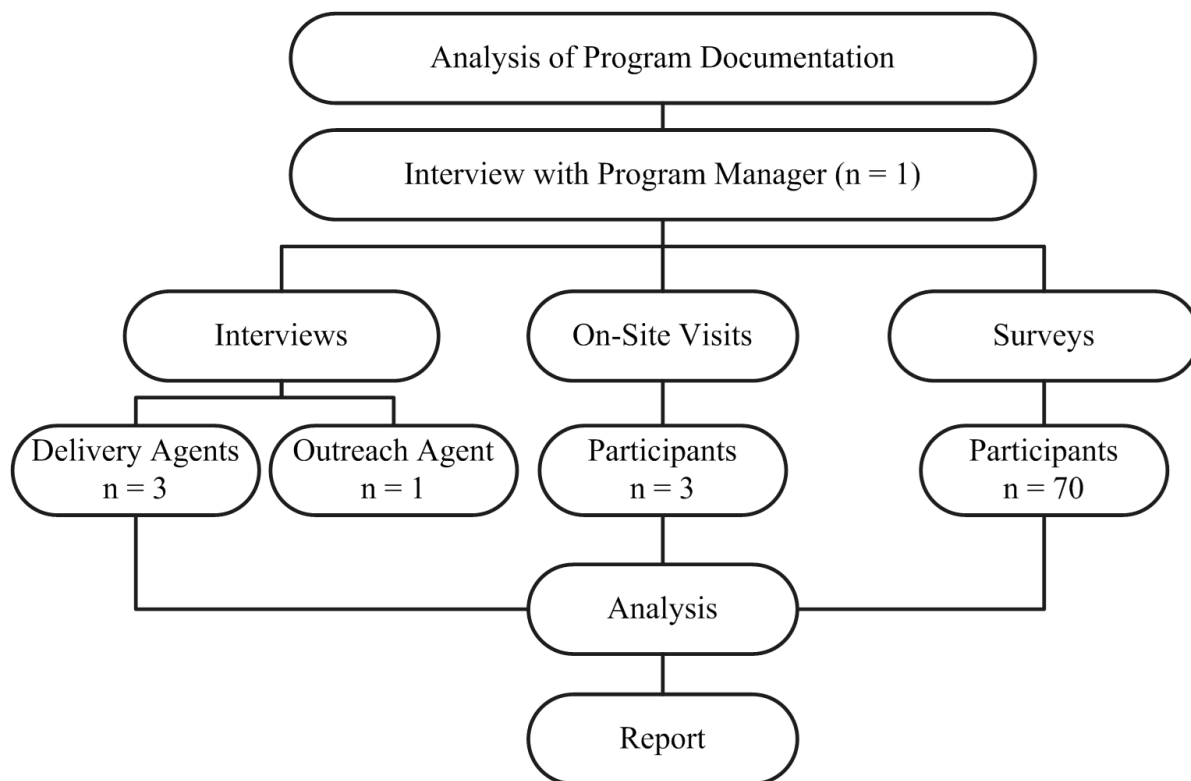
<sup>1</sup> Numbers 1 through 11 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guide and the survey questionnaire are included in Appendices IV, V, VI and VII.

**Figure 2: Methodological Model**



## 2.2 METHODOLOGY DESCRIPTION

### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the Low Income program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partner interviews for the process evaluation was finalized.

### **2.2.3 In-Depth Interviews with Program Partners**

In September, in-depth interviews were conducted with program DAs and OAs. These interviews were intended, among other things, to understand the partners' involvement in the program, their participation process in the program and their perception and level of satisfaction with the program.

### **2.2.4 On-Site Visits**

In December, three on-site visits were conducted at households where program measures had been implemented. The visits were conducted by Econoler's subcontractor, Philippe St-Germain, who is a certified ecoEnergy advisor. These site visits were used to validate that program auditors were

following the EnerGuide guidelines and that all pertinent information for running the house simulation with HOT2000<sup>2</sup> was collected.

The methodology used for the on-site visits under the Low Income program is further explained in the program impact evaluation section of this report.

### 2.2.5 Participant Survey

A telephone survey with a total of 70 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October and November utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 14 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > how participants learned about the program;
- > participant motivations, concerns and barriers;
- > measures in-service;
- > impact of program measures; and
- > satisfaction with the program.

The demographic profile of survey respondents is shown in Appendix III. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

| Survey                         | Population | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|--------------------------------|------------|-----------------|-------------------------------------------|
| 2010 Participants              | 680        | 62              | ±10.0%                                    |
| 2011 Participants <sup>3</sup> | 5,103      | 70              | ±9.7%                                     |

<sup>2</sup> HOT2000 is a residential energy analysis software approved by Natural Resources Canada for calculating EnerGuide ratings. This software was developed by the Housing, Buildings, Communities and Simulation (HBCS) group of CanmetENERGY, a division of Natural Resources Canada.

For additional information: [http://198.103.48.154/eng/software\\_tools/hot2000.html](http://198.103.48.154/eng/software_tools/hot2000.html).

<sup>3</sup> The population for the 2011 survey was 594 participants at the time of conducting the survey.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the Low Income program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, this process evaluation was customized to focus mainly on how to enhance program performance.

This process evaluation was performed through interviews with the PM and with the program partners, as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The Low Income program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as that found in the Low Income program manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | Low Income Program Manual |
|--------------------------------------------------------------------------------------------------------------|---------------------------|
| Document revisions                                                                                           | ⊘                         |
| Program description (including nature or type of program)                                                    | ✓                         |
| Program justification                                                                                        | ⊘                         |
| Program objectives                                                                                           | ✓                         |
| Incentives                                                                                                   | N/A                       |
| Eligibility criteria                                                                                         | ✓                         |
| Program partners and their roles                                                                             | ✓                         |
| Program barriers                                                                                             | ✓                         |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⚠                         |
| Details about the savings calculations and type of measures                                                  | ✓                         |
| Budget per year                                                                                              | ⊘                         |
| Cost-effectiveness test results                                                                              | ✓                         |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                     | Low Income Program Manual |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                              | ⊘                         |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                             | ✓                         |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                            | ⊘                         |
| Program theory                                                                                                                                                                                                                                                                                                                                                             | ⊘                         |
| Logic model                                                                                                                                                                                                                                                                                                                                                                | ⊘                         |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                 | ✓                         |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                  | ✓                         |
| Program forms                                                                                                                                                                                                                                                                                                                                                              | ✓                         |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                           |

Econoler analyzed the Low Income program manual. It contains relevant information useful for both the PM and the Evaluator. However, Econoler has the following recommendations to supplement and improve the tool:

- > **Revise the current process flow chart found in the program manual:** The program process flow chart illustrated in the program manual contains names of individuals in some places. The Evaluator recommends changing the name to a function. Furthermore, the audit should be referred to as an EnerGuide audit to clarify the type of audit and the reference to Scope II measures that currently appears at the end of the illustration could be mentioned further up in the process flow chart.
- > **Mention the EnerGuide audit and trainer activities:** The program manual neither mentions the energy audits that are performed in each house prior to implementing any measure nor does it cover the training activities offered by the DA to the auditors. These different steps are an important part of the participation process and should be documented in the manual.
- > **Monitor outreach activities:** The Evaluator recommends that outreach activities be monitored with performance indicators to evaluate the effectiveness of each activity in terms of enrolment in the program.

- > **Provide a “base case”:** The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.
- > **Provide the parameters used to estimate the program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler has reviewed the content of the tracking sheet for the Low Income program. The tracking sheet presents project information in one main sheet. The project tracking number and the information related to electric savings measures are listed in this sheet. The project tracking number refers to other sheets, which contain the client information. Those sheets are separated by region, making difficult the association between the project and the client information for telephone surveys.

In general, the main tracking sheet is quite complete and contains the necessary fields for program administration and evaluation purposes. It provides the PM with a way to continuously monitor the initial and final EnerGuide ratings, the number of each prescriptive measure implemented and the related energy savings.

The electric savings are monitored differently for the measures related to the EnerGuide rating, mainly envelope measures, and the prescriptive measures. For the first category, the energy savings are computed directly into the tracking sheet, by calculating the difference between the initial EnerGuide rating (D) and the final EnerGuide rating (E) and multiplying it by the average savings per EnerGuide point gained (1,047 kWh/point). Then, the total energy savings are multiplied by the percentage of space electric heating estimated for each house to only compute the electric savings. For projects



pending the final audit, the tracking sheet provides a temporary estimation of the savings based on a projection of the final EnerGuide rating (E). This projection is made during the initial audit and assumes that all the measures recommended in the initial audit are implemented. Since it is not representative of what happens in reality, ENSC uses a realization rate of 75 percent to estimate a temporary electric savings value for the envelope measures. In the 2011 final tracking sheet, the vast majority of projects had not yet had their final audit for estimating the actual E rating. ENSC explained that, for the year 2011 exceptionally, not everyone had had the final audit completed by the end of the year. Indeed, the fact that the Federal Government came back into EnerGuide<sup>4</sup> and the Team Buy Initiatives<sup>5</sup> organized for the EnerGuide for Existing Houses (EEH) program caused an increase in the number of participants in 2011 for both Low Income and EEH programs. As a result, the auditors became very busy in performing initial audits and important delays occurred for the completion of final audits.

For the prescriptive measures, ENSC uses a unitary savings value developed for each type of measure. The savings are calculated by multiplying the quantity of each prescriptive measure by its associated unitary savings value. These values are entered directly in each cell instead of using a reference to a separate table, which would facilitate the tracking.

However, the tracking sheet contains a lot of information that is not always easy to find and analyze. Additionally, the program tracking sheet was evaluated by the PM during the interview. The PM is somewhat satisfied with the tracking sheet and considers it moderately easy to work with.

To facilitate the use of the program tracking sheet for the PM and for the Evaluator, Econoler recommends the following:

- > **Add complementary information:** To help keep track of the unitary savings, the actual unitary savings value for each prescriptive measure should be referred to in another table instead of entering the value directly in the formula. This will allow for a better understanding of the savings calculations and the monitoring of the unitary savings in case of future modifications.
- > **Standardize the entries:** To avoid entering the same information in different ways and to reduce the number of data entry errors, ENSC should integrate a drop-down list of answers when possible. For instance, the space heating sources are identified in many different ways in the tracking sheet. By entering data with the help of a drop-down menu, the treatment of data for evaluation purposes will be more efficient.

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<sup>4</sup> The EEH program initially worked in conjunction with Natural Resources Canada's (NRCan) ecoENERGY Retrofit Homes program. However, in March 2010, NRCan ended its rebate offer a year earlier than anticipated. In June 2011, the Federal component of the EnerGuide program, including rebates, restarted.

<sup>5</sup> ENSC's Team Buy initiatives consisted of a marketing campaign organized as part of the EEH program where customers could save money by uniting to buy the same product. For more information on the Team Buy approach, visit the following website: <http://www.teambuy.ca/>.

- > **Implement a verification protocol:** A quick validation process should be developed and applied to the tracking sheet to flag inconsistencies and missing entries. There were a few entries in the tracking sheet that showed inconsistencies. In a few cases, the tracking sheet indicated that the house was not using any electricity for space heating (0 percent for electric heating) while other fields indicated that the primary or secondary source for space heating was electricity.
- > **Create fields for building energy consumption data:** Currently, the energy savings are in part calculated using the EnerGuide ratings. It would be suitable and more accurate to calculate them with the energy consumption data of HOT2000. Econoler proposes adding fields for building energy consumption per year in kWh for D and E audits.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, the Evaluator concludes that this program is essential to ENSC's program portfolio. Indeed, it allows for the engagement of low-income customers who have neither the financial resources nor the knowledge to implement energy efficiency measures that reduce their electricity bill and improve their quality of life. The following are comments and recommendations that would have an impact on the design and delivery of the program:

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Address the confusion around the program name:** The program has carried a few names through its existence (Low Income program and Low Income Homeowners). It was also integrated with the REAP program. According to program partners, the different name changes that occurred have created confusion among participants. Marketing research conducted by NSPI when the program was initiated found that the present program name (Low Income) was preferred because it was clear and explicit. Therefore, Econoler recommends addressing the confusion around the program name and putting forth effort to eliminate confusion in the market.

### 3.5 ON-SITE VISITS

The on-site visits conducted as part of the evaluation of the Low Income program aimed at assessing the procedure and the ecoEnergy protocol that the energy advisors had to follow during the audits. The ecoEnergy protocol was established by Natural Resources Canada (NRCan) to provide a framework for energy auditors. The D and E audits had to be conducted by a certified ecoEnergy advisor who answered any questions about energy use in the home, gathered information for identifying potential energy efficiency measures and collected energy bills and receipts. Each parameter that was, afterwards, to be used in the HOT2000 models had to be documented and the procedure clearly explained to the participants.

During the three on-site visits (one D audit and two E audits), the Evaluator noted that the advisors followed EcoEnergy protocol procedures well. The advisors collected key data and performed the blower door tests adequately; i.e., in accordance with the protocol. Furthermore, the time taken for performing the site visits concurred with the usual durations described in the protocol, namely 2.5 hours for the D audit and approximately 45 to 60 minutes for the two E audits. Nevertheless, the Evaluator identified a number of opportunities for improving on-site visit effectiveness.

In light of the on-site visit evaluation, the Evaluator recommends to:

- > **Explain in detail the protocol to the clients:** The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations). Participants may have difficulties understanding a number of these concepts. In addition, providing the participants with more details on the program allows them to consider other energy-saving opportunities (if any) than those proposed and selected for implementation through the D audit process.
- > **Spend more time explaining the basics of household energy use:** Successful implementation of a residential energy efficiency project relies greatly on occupants' comprehension of the project and its potential impacts. Energy advisor should therefore spend some time on site for explaining the household energy consumption and minimum energy savings basics to the participants. During on-site visits, energy advisors could, for instance, explain the household energy consumption as a whole, including the fact that potential energy efficiency measures may have relevant side effects on occupants' comfort and health. Additionally, further information on air leakage reduction and the related potential benefits (energy savings, comfort improvement) should be provided to the participants, especially because this issue represents a high energy savings potential in low-income households when compared to typical residential buildings.

- > **Encourage the energy advisor to provide participants with booklets:** Under its ecoENERGY program, NRCan developed a series of booklets for homeowners aiming to explain energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide “Keeping the Heat In”). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants adopting energy-wise habits. Furthermore, the general maintenance level of low-income households is usually lower than that of average households. Therefore, Econoler believes that providing the program participants with documentation on good maintenance practices, along with the related benefits (energy savings, comfort improvement, increased value of the property), would be another opportunity for improving the energy efficiency of low-income residential buildings.

### **3.6 RELATIONSHIP WITH PARTNERS**

Four program partners were interviewed under the process evaluation of the Low Income program: three DAs and one OA. Their level of satisfaction with the overall program and their relationship with ENSC’s team is very high. They are also very satisfied with the relationship they had with one another and with other partners, such as the contractor and the service organizations (DCS and SNSMR). However, one DA expressed a lower level of satisfaction with marketing and outreach activities and mentioned that satisfaction with the program was negatively affected by the poor understanding of program expectations from the service organizations, and by the poor training of the OA. Since this aspect was mentioned by one DA only, Econoler believes that there is no need to take specific actions at this time.

The DAs and the OA consider the participation process to be simple. The transition of responsibility to ENSC went smoothly with the PM according to all the program partners interviewed, but some did say that it created confusion in the market.

The program name change also created some confusion in the market. According to the DAs and the OA, participants mixed up the REAP and the Low Income program. Additionally, one DA wished that the “low income” be removed from the program name as several residents did not want to be associated with this expression. However, marketing research done by NSPI when the program was initiated found that the present program name (Low Income) was preferred because it was clear and explicit.

Several complaints were received from participants, mainly related to the measures implemented through the program. The participants mentioned to the DAs that the program did not cover the measures they were looking for or that the building envelope measures, such as roof, door and window measures, were insufficient. However, these measures sought by participants are not part of the program’s scope. Indeed, one of the DAs mentioned the unrealistic aspect of some expectations expressed by participants. Complaints regarding the timeline to complete the work were also received.

However, results from the participant survey show a high level of satisfaction with the program, with 91 percent of respondents being satisfied or very satisfied with the program.

Program partners have identified the main barrier to the program as being the enrolment of participants. To address this barrier, they suggest changing the eligibility process. According to one DA, this could be achieved by allowing an open application for all participants, regardless of the type of energy source used, while another DA recommends increasing the eligible income range. However, the new delivery model implemented by ENSC should improve program enrolment and address this important barrier.

In order to improve the program, program partners also recommend lowering the number of organizations involved in the program. It would not only reduce communication problems among the organizations and the time it takes to process submission files, but it would also minimize the confusion among homeowners as to which organization is handling their file. Similarly, the OA suggests improving the program with better communication with the DA so that the OA can roughly inform people on when they could expect their work to be done. If the DA had a scheduling database and the OA had online access to it, it could be possible to validate when the DA would likely contact a participant and inform the latter. Moreover, the OA declared not always having the information needed to fully answer questions from participants.

### **3.7 PARTICIPANT PERSPECTIVES**

This section shows the results of the telephone survey conducted with a total of 70 program participants. It is to be noted that survey results must be interpreted with caution since the particular market of low-income housing is a difficult population to survey. Furthermore, inconsistencies in respondents' answers were sometimes observed.

### 3.7.1 Program Awareness

Similar to previous years, word of mouth (17%) or receiving a letter about the program (13%) are the primary ways in which participants found out about the program. One in 10 participants read about it in the newspaper (11%) or in a bill insert (9%)<sup>6</sup>. Of note, sources of awareness are rather disparate since none of them reaches a high proportion of responses.

**Table 5: Program Awareness**

| Source of Awareness                       | 2009 | 2010 | 2011* |
|-------------------------------------------|------|------|-------|
| <i>Sample Size</i>                        | 55   | 62   | 70    |
| My neighbour, friend, co-worker or family | 15%  | 13%  | 17%   |
| I received a letter about the program     | 15   | 19   | 13    |
| Newspaper                                 | 9    | 5    | 11    |
| Bill insert                               | --   | --   | 9     |
| Someone called me about the program       | 11   | 15   | 6     |
| Through social/community services         | --   | --   | 6     |
| Poster                                    | --   | --   | 4     |
| Through ENSC website                      | --   | --   | 4     |
| Received a grant                          | --   | --   | 3     |
| While applying for fuel assistance        | --   | 6    | 1     |
| Internet/online                           | 4    | 8    | --    |
| Agency contact                            | 33   | 6    | --    |
| Advertisement                             | 2    | 3    | --    |
| Other                                     | 5    | --   | 16    |
| Don't know                                | 13   | 24   | 13    |
| *Multiple responses                       |      |      |       |

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<sup>6</sup> It should be noted that newspaper or bill inserts were not part of the 2011 marketing campaign of the Low Income program. If these answers show inconsistencies, they may also refer to ENSC's commercial campaign in general.

### 3.7.2 Participation Motivations and Barriers

Similar to 2010 results, saving money on electricity (46%) is the primary motivator for participating in the Low Income program. Improving insulation (23%), obtaining free services (9%) and making home improvements (9%) are other reasons mentioned by respondents for participating in the program.

**Table 6: Reasons for Participating**

|                                          | 2009                      |                                  | 2010                      |                                  | 2011                      |                                  |
|------------------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|
| Reasons for Participating                | Most Important Motivation | Other Reasons for Participating* | Most Important Motivation | Other Reasons for Participating* | Most Important Motivation | Other Reasons for Participating* |
| <i>Sample Size</i>                       | 55                        | 52                               | 62                        | 56                               | 70                        | 70                               |
| To save on energy costs/bills            | 18%                       | 29%                              | 48%                       | 21%                              | 46%                       | 16%                              |
| To improve insulation                    | 15                        | 4                                | 8                         | --                               | 23                        | 11                               |
| No cost for services                     | 24                        | 2                                | 8                         | 2                                | 9                         | 6                                |
| To make some home improvements           | --                        | --                               | --                        | --                               | 9                         | 6                                |
| To receive free CFLs                     | 2                         | --                               | --                        | --                               | 3                         | --                               |
| Comfort                                  | 15                        | 12                               | 8                         | 9                                | 1                         | 1                                |
| My old refrigerator was not working well | --                        | --                               | --                        | --                               | 1                         | --                               |
| To help the environment                  | --                        | 4                                | --                        | 4                                | --                        | 4                                |
| To receive a new refrigerator/freezer    | --                        | 2                                | --                        | 2                                | --                        | 3                                |
| To reduce greenhouse gases               | --                        | --                               | --                        | --                               | --                        | 3                                |
| To receive free power bars               | --                        | --                               | --                        | --                               | --                        | 1                                |
| To save energy                           | 16                        | 17                               | 6                         | 11                               | --                        | --                               |
| Overall good idea/needed it              | 2                         | 2                                | 5                         | 2                                | --                        | --                               |
| To know home's energy efficiency level   | --                        | --                               | 3                         | --                               | --                        | --                               |
| Older home                               | 2                         | --                               | --                        | --                               | --                        | --                               |
| To improve resale value                  | --                        | --                               | --                        | 2                                | --                        | --                               |
| Other                                    | 2                         | 4                                | 3                         | 2                                | 9                         | 10                               |
| None                                     | --                        | --                               | --                        | --                               | --                        | 4                                |
| Don't know                               | 5                         | 35                               | 10                        | 52                               | --                        | 13                               |
| Refused                                  | --                        | 4                                | --                        | 5                                | --                        | 27                               |
| *Multiple responses                      |                           |                                  |                           |                                  |                           |                                  |

Just four percent of respondents had concerns about participating in the Low Income program, which is consistent with findings from 2010. One respondent was concerned about having to pay some cost, and similarly, one did not believe that it was really free.

**Table 7: Participation Concerns**

| <b>Participation Concerns</b>     | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                | 55          | 62          | 70          |
| Had concerns about participation  | 13%         | 6%          | 4%          |
| <b>Specific Concerns</b>          | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample Size</i>                | 7           | 4           | 3           |
| That I'd have to pay something    | 1           | 2           | 1           |
| Didn't believe it was really free | 4           | 1           | 1           |
| That they would make a mess       | --          | 1           | --          |
| That I wouldn't be eligible       | 1           | --          | --          |
| Don't know                        | 1           | --          | --          |
| Other                             | --          | --          | 1           |



### 3.7.3 Measures In-Service

Eleven percent of respondents chose not to implement some measures recommended by the program, which is consistent with last year's findings. The eight respondents who chose not to implement one or more measures that were recommended, chose not to install dehumidifiers (n = 2), building envelope measures (n = 2), tank wraps (n = 1), CFL bulbs (n = 1), CFL torchiere lamps (n = 1), ceiling fixtures (n = 1) or had a second refrigerator or freezer removed (n = 1). The reasons for not implementing these measures were varied, with one respondent not believing the change would lower the energy bill and another that it was too much disruption.

**Table 8: Chose Not to Implement Recommended Measures**

| <b>Chose Not to Implement Recommended Measures</b>                         | <b>2009</b>  | <b>2010</b>  | <b>2011</b>  |
|----------------------------------------------------------------------------|--------------|--------------|--------------|
| <i>Sample Size</i>                                                         | 55           | 62           | 70           |
| Yes                                                                        | 4%           | 11%          | 11%          |
| No                                                                         | 96           | 87           | 84           |
| Don't know/refused                                                         | --           | 2            | 4            |
| <b>Measures Not Implemented</b>                                            | <b>2009*</b> | <b>2010*</b> | <b>2011*</b> |
| <i>Sample Size</i>                                                         | 2            | 7            | 8            |
| Dehumidifier                                                               | --           | --           | 2            |
| Building envelope measures                                                 | 2            | 1            | 2            |
| Tank wraps for electric hot water heaters                                  | --           | --           | 1            |
| CFL light bulbs                                                            | --           | --           | 1            |
| CFL torchiere lamps                                                        | --           | --           | 1            |
| Replacement of ceiling (flush mount) fixtures with CFL compatible fixtures | --           | --           | 1            |
| 2nd refrigerator and/or freezer removal                                    | --           | --           | 1            |
| Incandescent lamp replacement with CFLs                                    | --           | 2            | --           |
| Programmable thermostats                                                   | --           | 1            | --           |
| Low-flow showerheads                                                       | --           | 1            | --           |
| Low-flow faucet aerators                                                   | --           | 1            | --           |
| Electric kettles with auto shut-off                                        | --           | 1            | --           |
| Don't know/refused                                                         | --           | 1            | --           |
| <b>Reason</b>                                                              | <b>2009*</b> | <b>2010*</b> | <b>2011*</b> |
| <i>Sample Size</i>                                                         | 2            | 6            | 8            |
| Did not believe any changes would result in lower energy bills             | --           | 2            | 1            |
| Hassle factor, too much disruption to my daily routine                     | --           | 1            | 1            |
| They would scuff the paint                                                 | --           | 1            | --           |
| Other                                                                      | 2            | 3            | 7            |
| *Multiple responses                                                        |              |              |              |

Very few participants have removed any of the measures that were implemented through the program (3% or 2 respondents). One of these two respondents removed CFLs while the other stated having removed low-flow showerheads, low-flow faucet aerators and power bars. The removal of CFLs was due to non-compatibility with dimmer switches.

**Table 9: Measure Removal Verification**

| <b>Removed Any Measures From Your Home?</b> | <b>2011 (%)</b>  |
|---------------------------------------------|------------------|
| <i>Sample Size</i>                          | 70               |
| Yes                                         | 3%               |
| No                                          | 96               |
| Don't know/refused                          | 1                |
| <b>Specific Measures Removed</b>            | <b>2011* (#)</b> |
| <i>Sample Size</i>                          | 2                |
| CFLs                                        | 1                |
| Low-flow showerheads                        | 1                |
| Low-flow faucet aerators                    | 1                |
| Power bars                                  | 1                |
| *Multiple responses                         |                  |

### 3.7.4 Impact of the Program

The Low Income program had a positive impact on many aspects for participants. Three-quarters of participants agree that the measures implemented by the program have provided even temperatures throughout their home (76%) and seven in 10 indicated that the measures have made it more convenient to control temperature automatically (69%). Two-thirds have noticed fewer drafts throughout their home (67%) and 56 percent believe that they have longer lasting hot water or improved indoor and outdoor lighting (54%). Finally, 49 percent believe that the measures have reduced the noise level because of the replaced appliances.

**Table 10: Specific Impacts on Comfort**

| <b>Specific Impacts on Comfort*</b>                          | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                           | 55          | 62          | 70          |
| Provided even temperatures throughout the home               | 80%         | 79%         | 76%         |
| Made it more convenient to control temperature automatically | 84          | 66          | 69          |
| Noticeably fewer drafts throughout home                      | 85          | 80          | 67          |
| Provided longer lasting hot water                            | 53          | 52          | 56          |
| Improved indoor and outdoor lighting                         | 46          | 54          | 54          |
| Reduced the noise level of replaced appliances               | 35          | 28          | 49          |
| Other                                                        | 2           | --          | --          |
| Don't know                                                   | 6           | 7           | --          |
| *Multiple responses                                          |             |             |             |

Seven in 10 respondents have noticed improvements in their interest in energy efficiency (70%) while six in 10 respondents have seen improvements in their energy efficiency knowledge (58%).

**Table 11: Impact of Measures**

| <b>Impact of Measures*</b>                                                                              | <b>2009</b> | <b>2010 (#)</b> | <b>2011 (%)</b> |
|---------------------------------------------------------------------------------------------------------|-------------|-----------------|-----------------|
| <i>Sample Size</i>                                                                                      | 55          | 62              | 70              |
| Your energy efficiency interest                                                                         | 73%         | 61%             | 70%             |
| Your energy efficiency knowledge                                                                        | 70          | 46              | 58              |
| *Those giving a rating of 5 or 4 on a scale where 5= "considerable improvement" and 1= "no improvement" |             |                 |                 |

Over six in 10 (64%) participants believe the information they received from the energy evaluation has changed their behaviour in terms of using energy at home, which is a good result. This is similar to findings from 2009 and 2010.

From those respondents who reported that their behaviour had changed, one-half indicated that they now turn off their lights (49%) and four in 10 set their heating thermostat lower (38%). One in 10 use energy-efficient light bulbs (13%) while a similar number are generally more aware of how to save energy (9%). Other mentions by a small number of respondents include using less hot water when washing clothes (7%), closing doors and windows (7%), and using less hot water in general (7%).

**Table 12: Behaviour Change**

| <b>Behaviour Change</b>                 | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                      | 55          | 62          | 70          |
| Yes                                     | 66%         | 60%         | 64%         |
| No                                      | 29          | 35          | 36          |
| DK/refused                              | 5           | 5           | --          |
| <b>Specific Behaviour Change</b>        | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample Size</i>                      | 36          | 37          | 45          |
| I turn off my lights now                | 50%         | 51%         | 49%         |
| I set my heating thermostat lower       | 28          | 22          | 38          |
| Use energy-efficient light bulbs        | --          | --          | 13          |
| More aware of how to save energy        | --          | --          | 9           |
| I use less hot water to wash my clothes | 6           | 8           | 7           |
| Close doors and windows                 | 6           | 3           | 7           |
| Use less hot water                      | --          | --          | 7           |
| Unplug appliances                       | 17          | 22          | 2           |
| I set my water heater thermostat lower  | 6           | 5           | 2           |
| Hang clothes to dry                     | --          | --          | 2           |
| Changed lighting                        | 6           | 11          | --          |
| Use less fuel                           | 6           | --          | --          |
| Other                                   | 8           | 3           | 16          |
| Don't know                              | 8           | 16          | 2           |
| *Multiple responses                     |             |             |             |

Three in 10 respondents have noticed a drop in their energy bill (30%) while 16 percent have noticed an increase, which is generally consistent with findings from 2010. About half of the respondents (52%) have noticed no change or said that it is too soon to tell. This may reflect the fact that no participants in the 2011 program have gone through an entire heating season.

**Table 13: Changes Noticed in Energy Bills Since Installation**

| <b>Changes in Energy Bills</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>             | 55          | 62          | 70          |
| Bills have gone down           | 60%         | 40%         | 30%         |
| Bills have gone up             | 6           | 21          | 16          |
| No change in the bills         | 20          | 27          | 36          |
| Too soon to tell               | --          | --          | 16          |
| Don't know                     | 15          | 11          | 1           |
| Refused                        | --          | --          | 1           |

### 3.7.5 Satisfaction with Program

Participants were extremely satisfied with the Low Income program since almost all of them (96%) offered a rating of “very satisfied/satisfied.” In addition, specific program areas also received high levels of satisfaction including courtesy of energy evaluator (93%), energy efficiency presentation (92%), energy evaluator overall (90%), quality of work completed (88%), energy evaluation (88%), time required to complete the work (87%), contractor (87%), energy conservation measures implemented (86%) and energy evaluation report with recommendations (86%). Those findings are generally consistent with previous results, except for overall program communication (83%), which was deemed less satisfactory for the year 2011 than in 2010, although not statistically significant.

**Table 14: Satisfaction with Low Income Program**

| <b>Satisfaction with Program*</b>                | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------------------------|-------------|-------------|-------------|
| <i>Sample Size**</i>                             | 55          | 62          | 70          |
| Program overall                                  | 94%         | 90%         | 96%         |
| Courtesy of energy evaluator                     | 95          | 93          | 93          |
| Energy efficiency presentation                   | 95          | 84          | 92          |
| Energy evaluation evaluator overall              | 93          | 87          | 90          |
| Quality of the work completed                    | 95          | 81          | 88          |
| Energy evaluation                                | 92          | 89          | 88          |
| Time required to complete work                   | --          | 81          | 87          |
| Contractor/worker                                | 93          | 84          | 87          |
| Energy conservation measures implemented         | 93          | 81          | 86          |
| Energy evaluation report with recommendations    | 89          | 84          | 86          |
| Overall program communication                    | --          | 93          | 83          |
| *Percentage very satisfied/satisfied             |             |             |             |
| **Don't know/no answer removed from calculations |             |             |             |

The small number of participants who were dissatisfied with the program overall (three respondents) explained their dissatisfaction by not having received the insulation upgrade expected (n=1), by having received a new refrigerator that was not the right size (n=1) or by the fact that the thermostats they had received through the program were not installed by the program representative (n=1).

**Table 15: Reasons for Dissatisfaction with Low Income Program**

| Reasons for Dissatisfaction                       | 2011                  |               |
|---------------------------------------------------|-----------------------|---------------|
|                                                   | Most Important Reason | Other Reasons |
| <i>Sample Size</i>                                | 3                     | 3             |
| I don't like the envelope/insulation/wrap upgrade | 1                     | 2             |
| I don't like the refrigerator I received          | 1                     | --            |
| Other                                             | 1                     | 1             |

All respondents would recommend the program to a family member or friend. This result is a strong indicator of satisfaction.

**Table 16: Value of the Program**

| Would Recommend the Program to a Family Member or Friend | 2009 | 2010 | 2011 |
|----------------------------------------------------------|------|------|------|
| <i>Sample Size</i>                                       | 55   | 62   | 70   |
| Yes                                                      | 96%  | 97%  | 100% |
| No                                                       | 2    | 3    | --   |
| Don't know                                               | 2    | --   | --   |

### 3.7.6 Recommendations for Improvement

In terms of recommendations, two in 10 respondents (21%) would like to see more products or measures as part of the program, mainly window and door replacements. Less than one in 10 indicated that they would like to see improved communication (8%) and enhanced quality of work (7%).

As far as improving communication is concerned, one respondent suggested the following: "When the workers come in to your home, they should ask if it's ok to fix something, instead of just doing it. And they should also explain how they're going to do it."

The next table shows the summary of surveyed recommendations for improving the program.

**Table 17: Recommendations to Improve Program**

| <b>Recommendations to Improve Program</b>                | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|----------------------------------------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                       | 55          | 62          | 70          |
| Offer more products/measures to be installed/implemented | 13%         | 3%          | 21%         |
| Improve communication                                    | --          | 3           | 8           |
| Improve quality of work                                  | --          | 5           | 7           |
| Do the work promised                                     | --          | --          | 4           |
| Inspect the work after it is done                        | --          | --          | 4           |
| More employees to perform services/complete work faster  | 4           | 3           | 3           |
| Increase awareness through advertisement                 | 2           | 2           | 1           |
| More thorough audit                                      | 7           | --          | --          |
| Increase availability threshold                          | 4           | --          | --          |
| Other                                                    | 6           | 8           | 4           |
| None                                                     | 66          | 76          | 50          |

When asked if a diagram illustrating the steps of the Low Income program would be useful, seven in 10 respondents offered a rating of “significantly” or “somewhat” (71%). This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 18: Provision of a Diagram Illustrating Steps of Program**

| <b>Diagram Illustrating Steps of Low Income Program would have Facilitated Participation</b> | <b>2011</b> |
|----------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                           | 70          |
| Significantly                                                                                | 37%         |
| Somewhat                                                                                     | 34          |
| Slightly                                                                                     | 7           |
| Not at all                                                                                   | 4           |
| Don't know                                                                                   | 16          |
| Refused                                                                                      | 1           |



## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, Econoler analyzed the following parameters:

- > outcomes from HOT2000 simulations performed under the EnerGuide for Existing Houses (EEH) program;
- > prescriptive measure savings; and
- > energy-to-demand ratio for the calculation of demand savings.

The initial methodology included a billing analysis to establish an adjustment ratio between real and estimated savings for envelope measures (Scope I). The analysis included the maximum number of participants for which information on the month where measures had been implemented was available. It corresponded to program participants from June 2010 to October 2011. For these participants, billing data were obtained over a period of three years, going back to November 2008.

Successful billing analysis required that sufficient billing data be available to establish consumption trends during both the pre-installation and post-installation periods. Billing information and energy savings estimations for 435 participants were provided by Nova Scotia Power. For those customers, electricity consumption for the last three years and the corresponding heating degree-days for each period and for each customer were assembled totalling 9,791 observations (billing periods).

Before running the analysis, it was necessary to prepare the database so as to only keep participants and billing periods for which pre- and post-installation comparison was possible. After cleaning the database to only keep participants with electrical space heating, 127 participants remained. Since a validation of heating savings was only possible in the winter period, another criterion was applied to keep only participants with pre- and post-installation winter billing periods. Only 35 participants respected these criteria and were thus eligible for the billing analysis, which left us with a total of 51 billing periods. This small number of participants made it impossible to obtain realistic results from the billing analysis. Consequently, another approach was discussed for calculating the gross savings.

The resulting solution was to calculate energy and demand savings in the Low Income program using the unitary savings calculated in the EEH program since the program approach was almost identical. Accordingly, the gross savings calculations of the 2011 Low Income program included most EEH program evaluation features. Then, Econoler fine-tuned EEH program savings data using outcomes from the participant survey conducted with Low Income program participants.

Finally, the program net savings were evaluated by applying the interactive effects factors and the NTGR.

## **4.2 GROSS SAVINGS**

As mentioned previously, the 2011 evaluation of Low Income program gross savings per EnerGuide point increase is essentially based on the EEH program gross savings analysis. Within this latter program analysis, Econoler estimated the gross savings through the comparative analysis of the program tracking sheet data with results from 23 project simulations.

Furthermore, Econoler calculated unitary savings for each prescriptive measure implemented through the standard program (Scope I and Scope II) as well as through the First Nation Direct Install program. For each prescriptive measure, ENSC used a unitary savings estimation that was either based on past evaluation results from other programs with similar products or on other studies conducted by credible organizations. In some instances, the unitary savings estimates used by ENSC were based on a study conducted by Navigant Consulting, for which the assumptions used were not always available. In that case, Econoler based its review on other studies like the 2011 Ontario Power Authority (OPA) Prescriptive Measures and Assumptions report<sup>7</sup>. This document is a reliable secondary data source in which the assumptions used for savings calculations are well documented.

The last part of the gross savings analysis involved calculating the program gross demand savings. To that end, Econoler used an energy-to-demand ratio that had been specifically developed for the Low Income program.

The next sections detail the gross energy and demand savings calculations.

### **4.2.1 Savings per EnerGuide Point**

ENSC calculated a portion of the program's energy savings using an incremental savings coefficient per increase of EnerGuide point (also referred to as "savings per EnerGuide point"). In ENSC's methodology, the difference between pre-audit (D) and post-audit (E) simulation ratings was used for calculating the increase of EnerGuide point. In 2011, only 35 percent<sup>8</sup> of the participants that had had a D audit conducted also had an E audit performed before the end of the year. For this reason, the PM used projections of final EnerGuide rating for calculating the energy savings related to house improvements that had been taken into account in HOT2000 simulations. The average EnerGuide rating increase related to these projections was 6 EnerGuide points.

For fear that the projected final EnerGuide ratings overestimate the actual program savings, ENSC also took into consideration a realization rate of 75 percent for all projects (regardless of whether the E

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<sup>7</sup> Ontario Power Authority (OPA), "2011 Prescriptive Measures and Assumptions," Release Version 1, March 2011.

<sup>8</sup> Only 111 of the 314 participants that had had a D audit conducted also had an E audit performed. For the other 203 participants, the measures were implemented before the end of the year but since the emphasis was put on reaching new customers, many E audits were postponed to 2012.

audit was completed or not) in its energy savings per EnerGuide point calculations. In the final program tracking sheet, it is worth noting that most of the EnerGuide point increases were calculated using the projected final EnerGuide rating values, even for a number of projects that had been the object of an E audit.

In 2011, ENSC used an energy savings of 1,047 kWh per EnerGuide point. The 1,047 kWh savings figure came from the 2010 EEH program evaluation report. In addition, the savings per EnerGuide point were calculated by ENSC as a function of the percentage of the space heating load delivered by electricity (ranging from 0 to 100%).

For the 2011 Low Income program evaluation, Econoler used the same energy savings coefficients as those calculated in the 2011 EEH program evaluation. For this program evaluation, Econoler conducted several analyses to confirm the savings per EnerGuide point figure of ENSC. The details of these analyses are included in the EEH program evaluation report. The main features of this work are summarized below:

- > First, Econoler established a representative sample of 23 EEH projects. Econoler evaluated the average value of savings per EnerGuide point of the sample projects using the initial and final energy consumption data simulated with HOT2000 in relation with the respective EnerGuide ratings. The overall average of these savings values per project amounted to savings of 1,089 kWh per EnerGuide point.
- > Subsequently, Econoler performed a linear regression analysis, based on the initial and final building energy consumption of all EEH sample projects as a function of the respective EnerGuide rating of each project. Through this regression analysis (which was proven statistically acceptable), the Evaluator found a regression coefficient (1,052 kWh) almost equal to the previously calculated EnerGuide savings per point (1,089 kWh). Econoler decided to use the first energy savings coefficient (i.e., 1,089 kWh per EnerGuide point) as a basis for energy savings computation.
- > Then, Econoler noted that the EEH HOT2000 simulations tended to overestimate residential building electricity consumption. A simulation calibration based on the billing data of 23 EEH sample projects<sup>9</sup> was therefore conducted to evaluate the accuracy of the results obtained from the HOT2000 simulations. This analysis demonstrated that the HOT2000 software overestimates the consumption by at least approximately 25 percent. As a result, this last percentage was used to lower the evaluated average savings per EnerGuide point (1,089 kWh) previously defined. This yielded a final savings value of **817 kWh** per EnerGuide point.

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<sup>9</sup> Econoler conducted a simulation calibration based on the billing data of 17 of the 23 EEH sample projects. In fact when analyzing the data received, Econoler found that six out of the 23 sets of data were considered unreliable. More specifically, five of these six projects had a very small energy consumption compared to typical values expected for a home in Nova Scotia. For the other project, the format of the billing data was not standard, which made the data unusable. These six series of billing energy consumption data were therefore discarded before performing the billing analysis.

For establishing the EnerGuide point increase per project, Econoler used the final EnerGuide rating (given upon completion of the E audit) when this figure was available in the program tracking sheet. For the projects which had not received an E audit in 2011, the Evaluator used the final EnerGuide rating forecast by ENSC along with the assumed realization rate (75%). These assumptions led to an average EnerGuide rating increase of 4 points, which can be deemed conservative. In comparison, the same EnerGuide rating increase was used within the EEH program for estimating the energy savings of the projects which had not had an E audit conducted before the end of 2011. In the event that either the E audit EnerGuide rating or the projected final EnerGuide rating was lower than the initial EnerGuide rating, the Evaluator considered that the corresponding project had not realized any savings in 2011.

Similarly to ENSC's gross savings assessment methodology, Econoler finally adjusted the savings per EnerGuide point value (817 kWh per year) in relation with the percentage of the space heating load delivered by electricity for each participant.

#### **4.2.2 CFLs**

ENSC used the same unitary savings value of 41 kWh for all CFLs installed under its residential programs. This assumption came from an analysis conducted for the 2009 evaluation of the Low Income program. It presented several studies indicating that 13 W CFLs showed annual savings ranging from 29.6 kWh to 44.3 kWh and recommended continuing to use the 41 kWh savings assumption. This past evaluation considered that 13 W CFLs usually replaced 60 W incandescent bulbs; as a result, the time of operation used to calculate the 41 kWh saving should be equal to 2.4 h/day. This, in turn, corresponds to the daily usage of interior fixtures estimated from the telephone survey conducted in 2010 under the Retail Markdown Program (RMP).

This value was revised by Econoler for three different categories of CFL products. More specifically, the program offered the installation of three types of CFLs that used these unitary savings figures: 13 watt, 23 watt and specialty CFLs. Since these three types of products were entered separately in the tracking sheet, Econoler elected to establish a different unitary savings value for each of them.

#### **13 Watt CFLs**

According to the ENERGY STAR® light output equivalency table, a 13 watt CFL provides the same light output (lumens) as a 60 watt incandescent lamp. Thus, the replacement of a 60 watt incandescent lamp for a 13 watt CFL is considered the base case for this product and corresponds to a displaced wattage of 47 W.

As for all ENSC residential programs, the daily usage of 13 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program. The value used by ENSC (2.4 h/day) was estimated from participant declarations during a telephone survey. However,

Econoler considered that the daily usage of 2.7 hours from Hydro-Québec's metering study<sup>10</sup> was more accurate. When available, metering data should always be prioritized instead of using estimations from a self-declaration approach where many behavior factors can influence the respondents' answers.

The review resulted in a unitary savings value for 13 watt CFLs of 46.3 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(60 \text{ W} - 13 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 46.3 \frac{\text{kWh}}{\text{yr}}$$

## 23 Watt CFLs

For estimating the unitary savings value for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the actual wattage of the CFLs (23 W) and the average wattage of the incandescent lamps typically replaced by such CFLs. Based on the data collected through the Efficient Products – Direct Install program for residential buildings, Econoler estimated that old incandescent lamps replaced by 23 watt CFLs have an average wattage of 93.5 W. This value is consistent to what is found on the market. In fact, according to the ENERGY STAR light output equivalency table, 23 watt CFLs are comparable to 75 or 100 watt incandescent lamps. However, incandescent lamps of 75 watt are rarely available on the market and manufacturers indicate more often that the light output of a 23 watt CFL is sufficient to replace a 100 watt incandescent lamp. Thus, Econoler considers using an average replaced wattage of 93.5 W adequate, which takes into account the typical incandescent lamps on the market that can be replaced by 23 watt CFLs. It results in an average displaced wattage of 70.5 W.

As for 13 watt CFLs, the daily usage of 23 watt CFLs was adjusted to 2.7 hours, based on a metering study conducted for Hydro-Québec's residential lighting program.

The review resulted in a unitary savings value for 23 watt CFLs of 69.5 kWh, as shown below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

<sup>10</sup> Econoler, "Evaluation Report: Programme Produits Mieux Consommer – Éclairage résidentiel," presented to Hydro-Québec, Quebec, March 30, 2011.

## Specialty CFLs

For the specialty CFL gross savings evaluation, Econoler used the unitary savings figure calculated in the 2011 RMP evaluation. Through this latter program evaluation, Econoler estimated the average displaced wattage by comparing the average wattage of CFLs sold through the program and the average equivalent wattage of the incandescent lamps replaced, using the light output equivalency table. This analysis revealed that the typical difference in wattage between the CFLs installed through the program and the old lamps replaced was equal to 50.5 watts.<sup>11</sup>

As for the other CFL unitary savings adjustments, the Evaluator then modified the daily usage from 2.4 to 2.7 hours. This last figure was based on a metering study conducted for Hydro-Québec's residential lighting program.

As a result, the unitary savings value for specialty CFLs was adjusted to 49.8 kWh per year, as shown in the next equation. Finally, this final unitary savings figure is coherent with that used by ENSC in its gross impact calculations; i.e., 41 kWh per year.

$$\text{Annual Unitary Savings} = \frac{(64.9 \text{ W} - 14.4 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 49.8 \frac{\text{kWh}}{\text{yr}}$$

### 4.2.3 Flush-Mount CFLs and CFL Porch Lights

In 2011, ENSC promoted the installation of flush-mount CFLs and CFL porch lights under the Low Income program. For these two products, ENSC used a unitary savings value of 34 kWh per year, based on the Navigant study for which the calculation details were not available. Within the 2011 gross program savings calculated by ENSC, flush-mount CFLs and CFL porch lights accounted respectively for 0.03 percent and 0.05 percent of total gross savings<sup>12</sup>. These savings could thus be considered negligible in comparison to overall program impacts.

With that in mind, Econoler decided to use the unitary savings value calculated for specialty CFLs; i.e., 49.8 kWh per year.

<sup>11</sup> In the 2011 RMP evaluation report, the average power of CFLs was 14.4 watts and the average equivalent power of incandescent lamps replaced was 64.9 watts.

<sup>12</sup> In ENSC's program tracking sheet, flush-mount CFL and CFL porch light savings were respectively of 2,210 kWh and 3,404 kWh. In comparison, ENSC tracked gross savings at the meter for this program were approximately 6.33 GWh.

#### 4.2.4 CFL Torchieres

ENSC estimated the unitary savings for CFL torchieres at 241 kWh per year. This figure was based on the Navigant study mentioned earlier. The assumptions used to estimate this value were not available. Therefore, Econoler based its review on other studies and assumptions.

As for 23 watt CFLs, the average displaced wattage was estimated by calculating the difference between the average wattage of CFL torchieres installed through the pilot project (23 W) and the average wattage of the incandescent lamps typically replaced by 23 watt CFLs (93.5 W). Thus, the average displaced wattage is 70.5 watts.

For the hours of operation, Econoler used the same daily usage of 2.7 hours, as was the case with CFLs.

Using these assumptions, the annual unitary savings value for CFL torchieres was calculated based on the equation below.

$$\text{Annual Unitary Savings} = \frac{(93.5 \text{ W} - 23.0 \text{ W}) \times 2.7 \frac{\text{h}}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{W}}{\text{kW}}} = 69.5 \frac{\text{kWh}}{\text{yr}}$$

Therefore, the unitary savings estimation of 241 kWh was adjusted to 69.5 kWh.

#### 4.2.5 LED Nightlights

In 2011, LED nightlights were installed through the Low Income program. Based on a technical reference manual from the Pennsylvania Public Utility Commission<sup>13</sup>, ENSC estimated a unitary savings value of 26 kWh for the installation of LED nightlights. The assumptions behind this savings calculation are presented in the table below.

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<sup>13</sup> Pennsylvania Public Utility Commission, "Technical Reference Manual," Pennsylvania, June 2011.

**Table 19: Unitary Savings Estimation for LED Nightlights**

| Parameters                             | Values        |
|----------------------------------------|---------------|
| Old Wattage (incandescent nightlights) | 7 W           |
| New Wattage (LED nightlights)          | 1 W           |
| Average Displaced Wattage              | 6 W           |
| Operating Time                         | 12 h/day      |
| <b>Annual Savings</b>                  | <b>26 kWh</b> |

As for the Efficient Products – Low Income Renter (LIR) program, Econoler considered a wattage value of 0.3 W for the LED nightlights installed under the Low Income program. These lights are used to replace old nightlights, which are traditionally made of a 7 W incandescent light. Such replacement resulted in an average displaced wattage of 6.7 W, which was used by Econoler for this evaluation.

The 12-hour/day operation time used by the Pennsylvania Public Utility Commission represents a nightlight that is turned on all night. Econoler could not find any other jurisdiction to support this value. However, the Evaluator considered that the 12-hour value would be adequate. The LED nightlights installed are equipped with a sensor that automatically turns on the nightlight when it is dark. Therefore, the nightlights installed in rooms that are not affected by daylight are likely to remain on for several hours during the day. For nightlights installed in rooms affected by daylight, there is a potential operating time of 11.8 hours per day since the average time of illumination in Halifax is 12.2 hours per day<sup>14</sup>. Another element justifying the operating time of 12 hours lies in the fact that on-site visits conducted for the LIR program revealed an average usage of 11.8 hours a day, based on participant declarations.

Using a displaced wattage of 6.7 W and an average operating time of 12 hours a day, Econoler calculated a unitary savings value of 29.3 kWh. This value was used in the gross savings calculations for the LED nightlights.

#### 4.2.6 Programmable Thermostats

For programmable thermostats installed through the Low Income program, ENSC used a unitary savings value of 63.15 kWh per year. This value came from the OPA report. The baseline corresponds to a standard electronic thermostat. As a result, the energy savings were calculated from the

<sup>14</sup> National Research Council Canada, Sunrise/Sunset Calculator, Standard times of solar rise for Halifax, Nova Scotia, 2011, <http://www.nrc-cnrc.gc.ca>.



temperature setback that could be set at night with a programmable thermostat. To do so, the OPA considered a savings value of 1 percent for every degree setback<sup>15</sup>.

In the RMP evaluation, Econoler reviewed another study to adjust the unitary savings value used for programmable thermostats. The 2009 evaluation of Hydro-Québec's Residential Electronic Thermostats in New Construction program<sup>16</sup> estimated the energy savings generated by the thermostat accuracy and by the temperature setback. The table below presents the results of this evaluation.

**Table 20: Main Outputs from Hydro-Québec's Evaluation of Electronic Thermostat Savings**

| Calculation Parameters                                                               | Housing Type    |                                 |           |
|--------------------------------------------------------------------------------------|-----------------|---------------------------------|-----------|
|                                                                                      | Single-Detached | Duplex / Triplex /<br>Townhouse | Apartment |
| <b>Gross Energy Savings for Electronic Thermostat Accuracy</b>                       |                 |                                 |           |
| Percentage of savings due to the thermostat accuracy                                 | 9.0%            | 5.5%                            | 4.5%      |
| Annual consumption for electric space heating (before thermostat installation) [kWh] | 12,542          | 7,734                           | 4,782     |
| Savings per housing [kWh]                                                            | 1,129           | 425                             | 215       |
| Number of thermostats per housing                                                    | 9.36            | 4.52                            | 3.55      |
| Savings per thermostat [kWh]                                                         | 121             | 94                              | 61        |
| <b>Gross Energy Savings for Temperature Setback with Programmable Thermostats</b>    |                 |                                 |           |
| Savings per housing [kWh]                                                            | 434             | 333                             | 225       |
| Number of programmable thermostats per housing                                       | 4.33            | 1.66                            | 1.91      |
| Savings per thermostat [kWh]                                                         | 100             | 201                             | 118       |

For the calculation of savings due to the electronic thermostat accuracy, the percentages of savings were based on research supervised by Hydro-Québec's laboratory of energy technologies (LTE)<sup>17</sup>. The research used results from tests conducted in LTE environmental chambers and in single-family homes by comparing the operation of bimetallic thermostats versus electronic thermostats and the consumption of houses with bimetallic thermostats versus electronic thermostats. The annual consumption for electric space heating was estimated through a billing analysis including 25,703 clients and 206,861 billing periods.

<sup>15</sup> U.S. Department of Energy, Energy Savers – Thermostats and Control Systems, <http://www.energysavers.gov>, last update: 2011-09-02.

<sup>16</sup> Econoler, "Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel," Final Report presented to Hydro-Québec, February 9, 2009.

<sup>17</sup> Hydro-Québec – Laboratoire des technologies de l'énergie (LTE), Sommaire exécutif de rapports publiés par Hydro-Québec concernant les économies d'énergie dues aux thermostats électroniques, October 2004.

For the calculation of savings due to the temperature set back, the savings per housing resulted from a billing analysis regression which compared the consumption of houses with electronic thermostats and houses with programmable thermostats.

As the unitary savings value of 63.15 kWh currently used by ENSC is a theoretical value based on an engineering calculation, Econoler considers more adequate to use the results from LTE tests conducted in environmental chambers and in single-family homes as well as the billing analysis from Hydro-Québec's evaluation report. Moreover, such report includes the savings due to the higher level of accuracy obtained from the replacement of an old bimetallic thermostat with an electronic model. Since the field data from the Efficient Products – Direct Install program evaluation showed that the baseline in Nova Scotia should be established as bimetallic thermostats, Econoler considers that these savings should be added to the temperature setback savings.

To make these savings applicable to the programmable thermostats installed through the Low Income program, there was a need to adjust these values on the basis of the proportion of housing type in Nova Scotia's low-income household market. However, the program tracking sheet did not provide information on the share of each housing type. Since the programmable thermostats installed in single-detached houses had generated less savings than those installed in duplex, triplex or townhouses (respectively 221 kWh per year and 295 kWh per year), it was deemed a conservative assumption to consider that 100 percent of all program participants resided in single-detached houses.

In light of the above, Econoler estimated the total unitary savings value associated with the installation of a programmable thermostat at 221 kWh per year. This latter figure was used in the Low Income program impact evaluation for 2011.

#### **4.2.7 Electric Kettles**

Electric kettles were installed through the standard Low Income program as well as through the First Nation pilot project. For this product, ENSC used a unitary savings value of 49 kWh per year, based on the Navigant study for which the calculation details were not available. This value had also been used in previous evaluations of the Low Income Homeowner program. Since Econoler was unable to find secondary information on energy savings estimations for electric kettles, the unitary savings value of 49 kWh per year was maintained for this year's evaluation.

#### **4.2.8 Power Bars with Integrated Timer**

ENSC promoted the installation of power bars with integrated timer through the Low Income program as well as through the First Nation pilot project. This product helps reduce the standby power of the electronic devices plugged into it.

Based on the OPA report, ENSC used a unitary savings value of 53 kWh per year for each energy-saving power bar installed. The OPA calculated the annual savings for this product using a weighted average of the savings generated for each group of electric devices that can be plugged into a power bar. The details of this calculation are shown in the next table.

**Table 21: OPA Unitary Savings Estimate for Power Bars with Integrated Timer**

| Parameters                      | Entertainment Centres | Computer Systems | Lighting   | Others     |
|---------------------------------|-----------------------|------------------|------------|------------|
| Proportion                      | 40.3%                 | 15.7%            | 19.4%      | 24.6%      |
| Average Wattage                 | 38.1 W                | 28 W             | 60 W       | 28 W       |
| Old Operating Time              | 9 h/day               | 14 h/day         | 6 h/day    | 11 h/day   |
| New Operating Time – with Timer | 5 h/day               | 8 h/day          | 3 h/day    | 4 h/day    |
| Operating Season                | 12 months             | 12 months        | 8.5 months | 8.6 months |
| <b>Annual Savings</b>           | <b>53.09 kWh</b>      |                  |            |            |

Econoler considered these assumptions acceptable. The on-site visits conducted through the LIR program revealed that the power bars with integrated timer had mainly been installed on entertainment centre devices, which confirmed the proportion of 40 percent used for this electronic device. Therefore, Econoler continued using the unitary savings value of 53 kWh per year for the installed power bars with integrated timer.

#### 4.2.9 Dehumidifiers

The Low Income program promoted the replacement of dehumidifiers with more efficient models. In addition, ENSC installed several dehumidifiers in households where there was no humidifier in place before the project.

With regard to the replacement of existing dehumidifiers, ENSC used a unitary savings value of 108 kWh per year for each installed product. This figure was based on the Wisconsin's Focus on Energy program<sup>18</sup> by subtracting the new ENERGY STAR-qualified dehumidifier consumption, estimated at 627 kWh, from the old one, estimated at 735 kWh.

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<sup>18</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.

For this year's evaluation, the savings resulting from the replacement of an old dehumidifier with an ENERGY STAR model were estimated at 686 kWh per year. The assumptions used for this calculation are shown below.

**Table 22: Unitary Savings Calculation for Dehumidifier Replacement**

| Parameters                                  | Values               |
|---------------------------------------------|----------------------|
| Capacity of the Dehumidifier                | 17.4 litres per day  |
| Efficiency – Old Conventional Unit          | 0.66 litres/kWh      |
| Efficiency – New ENERGY STAR-Qualified Unit | 1.50 litres/kWh      |
| Usage                                       | 1,114 hours per year |
| <b>Annual Unitary Savings</b>               | <b>686 kWh</b>       |

The assumptions presented above are based on the 2008 evaluation of the Ontario Power Authority's (OPA) Every Kilowatt Counts program<sup>19</sup> and are consistent with the 2011 evaluation report of the Efficient Products – Appliance Retirement (ARet) program.

Regarding the installation of high-efficiency dehumidifiers in houses where there was no such appliance before the project, ENSC applied an additional energy consumption of 1,000 kWh per year. These appliances were in fact provided to participants mainly for improving occupant comfort as well as for moisture control, especially when there was insulation work done in the participant's house. If ENSC had not given new high-efficiency dehumidifiers to those program participants, such participants would have either purchased a dehumidifier on their own, probably with a lower level of efficiency, or not. In the event that those participants had purchased a dehumidifier, ENSC would likely have generated energy savings through the installation of ENERGY STAR units. Otherwise, the high efficiency units installed by ENSC through the program would increase household consumption.

In light of the above, the Evaluator decided to keep a conservative approach and considered neither additional consumption nor energy savings for the new dehumidifiers installed in houses where there was no dehumidifier before the project.

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<sup>19</sup> The Cadmus Group, Evaluation of the Ontario Power Authority's 2008 Every Kilowatt Counts Power Savings Event, Keep Cool Pilot and Rewards for Recycling Programs, Final Report, Prepared for the Ontario Power Authority, July 9, 2009.

#### 4.2.10 Refrigerator Replacements

In 2011, ENSC promoted the replacement of old refrigerators with more efficient models through the Low Income program. For this appliance replacement measure, ENSC used a unitary savings value of 850 kWh per year. This figure was based on the 2010 evaluation of the Efficient Products – Appliance Retirement and Replacement programs. More precisely, the unitary savings value of 850 kWh per year used by the PM in 2011 was the average of the savings values found in 2010 for the replacement of the primary (868 kWh/year) and secondary (833 kWh/year) refrigerators in the residential sector.

Under the 2011 Energy Efficient – Appliance Replacement (ARep) program evaluation, Econoler estimated that the replacement of old refrigerators with new ENERGY STAR units could save 817 kWh per year. This unitary savings value was obtained by subtracting the annual consumption of old refrigerators, estimated at 1,104 kWh, from the annual consumption of new ENERGY STAR models, corresponding to 287 kWh on average.

**Table 23: Unitary Savings Calculation for Refrigerator Replacement**

| Parameters                                  | Values         |
|---------------------------------------------|----------------|
| Base Annual Consumption – Old Refrigerators | 1,104 kWh      |
| New Annual Consumption – New Refrigerators  | 287 kWh        |
| <b>Annual Unitary Savings</b>               | <b>817 kWh</b> |

#### 4.2.11 Freezer Replacements

The Low Income program supported the replacement of existing inefficient freezers with high efficiency models. For each replaced freezer, ENSC used a unitary savings figure of 557 kWh per year. This value was based on the 2010 evaluation of the Efficient Products – Appliance Retirement and Replacement programs. More precisely, this value was calculated in 2010 for the secondary freezer being replaced through the program.

Under the 2011 ARep program evaluation, Econoler estimated that the replacement of old freezers with new ENERGY STAR units could save 637 kWh per year. This unitary savings value was obtained by subtracting the annual consumption of old freezers, estimated at 916 kWh, from the annual consumption of new ENERGY STAR models, corresponding to 279 kWh on average.

**Table 24: Unitary Savings Calculation for Freezer Replacement**

| Parameters                             | Values         |
|----------------------------------------|----------------|
| Base Annual Consumption – Old Freezers | 916 kWh        |
| New Annual Consumption – New Freezers  | 279 kWh        |
| <b>Annual Unitary Savings</b>          | <b>637 kWh</b> |

#### 4.2.12 Refrigerator Retirements

In 2011, the Low Income program promoted the retirement of old refrigerators through the Efficient Products – Appliance Retirement (ARet) program. However, there were still some cases where the participants did not take part in the ARet program and retired their refrigerators through the Low Income program. In these particular cases, the refrigerator retirements were claimed under the Low Income program.

For this appliance retirement measure, ENSC used a unitary savings value of 776 kWh per year, based on the 2010 evaluation of the ARet and the Efficient Products – Appliance Replacement programs. This value was calculated for each secondary refrigerator being retired in the framework of the program.

Under the 2011 ARet program evaluation, Econoler estimated that the average unitary savings value for the retirement of a secondary refrigerator was of 1,016 kWh per year. This result was based on an average consumption of 1,373 kWh for the unit retired, a partial use factor of 0.74 and an occupant adjustment factor of 1.12. The average consumption of old refrigerators was obtained from the metering activity conducted at the recycling facility to measure the consumption of the old refrigerators retired through the ARet program.

#### 4.2.13 Freezer Retirements

The Low Income program promoted the retirement of existing inefficient freezers from participant houses through the ARet program. As was the case with refrigerators, there were some cases where the participants did not take part in the ARet program and retired their freezers through the Low Income program. In these particular cases, the freezer retirements were claimed under the Low Income program.

For each retired freezer, ENSC used a unitary savings figure of 705 kWh per year. This value was based on the 2010 evaluation of the Efficient Products – Appliance Retirement and Replacement programs and was calculated for the retirement of secondary freezers.

Under the 2011 ARet program evaluation, Econoler estimated that the average unitary savings value for the retirement of a secondary freezer was of 1,274 kWh per year. This result was based on an average consumption of 1,223 kWh for the unit retired, a partial use factor of 0.93 and an occupant adjustment factor of 1.12. As for refrigerator retirements, the average consumption of old freezers was obtained from the metering activity conducted at the ARet program recycling facility.

#### 4.2.14 Faucet Aerators

In 2011, faucet aerators were installed through the Low Income program as well as through the First Nation pilot project. ENSC used a unitary savings value of 86 kWh per year for faucet aerators based on the Navigant study. However, the assumptions used to estimate this value were not available. As a result, Econoler used other studies and assumptions to conduct its revision.

To do so, Econoler reviewed two studies estimating the annual unitary savings value for the installation of faucet aerators.

**Table 25: Unitary Savings Estimate for Faucet Aerators from Other Jurisdictions**

| Annual Unitary Savings | Source                                             |
|------------------------|----------------------------------------------------|
| 176.3 kWh              | OPA                                                |
| 159.1 kWh              | Wisconsin Focus on Energy Evaluation <sup>20</sup> |

The annual unitary savings value presented in the above table is an average savings value per faucet, calculated from three faucets; i.e., one installed in the kitchen and two in the bathrooms. Both studies used a base flow rate of 2.2 gpm, which was reduced by 31.8 percent to approximately 1.5 gpm. Econoler considered these assumptions appropriate. The narrow gap between both values was mainly due to a difference between the average hot water usage assumptions.

Econoler decided to use the OPA unitary savings since a comparison with a Canadian province was more appropriate and because many unitary savings values from the OPA were already deemed acceptable for most products promoted through ENSC programs. Therefore, the unitary savings value that was used in the current evaluation was 176.3 kWh per year.

The OPA calculated an average unitary savings value assuming that the aerators would be installed in different rooms (including kitchens and bathrooms). The Evaluator therefore used the same unitary

<sup>20</sup> Public Service Commission of Wisconsin, Focus on Energy Evaluation, conducted by PA Consulting Group, Final Report, June 24, 2008.

savings (176.3 kWh per year) for each faucet aerator, whether they were installed in the kitchen or in the bathroom. Finally, it is worth noting that the Evaluator calculated savings for this product only when the energy used for domestic water heating was electricity.

#### 4.2.15 Low-Flow Showerheads

In 2011, low-flow showerheads were installed through the standard program as well as through the First Nation pilot project. For this product, ENSC used a unitary savings value of 157 kWh per year. This savings value was based on the Navigant study for which the calculation details were not available. Therefore, Econoler used other sources of data to review the unitary savings generated by the installation of low-flow showerheads.

In the OPA report, the annual savings for low-flow showerheads were calculated using the assumptions below.

**Table 26: OPA Unitary Savings Estimate for Low-Flow Showerheads**

| Parameters                                  | Values                       |
|---------------------------------------------|------------------------------|
| Typical Flow Rate for a Low-Flow Showerhead | 4.73 L/min (1.25 gpm)        |
| Average Flow Rate for a Regular Showerhead  | 7.57 L/min (2.0 gpm)         |
| Average Amount of Showers Taken             | 2.3 showers/day/household    |
| Average Showering Time                      | 7.5 minutes                  |
| Average Shower Temperature                  | 40°C (104°F)                 |
| <b>Annual Savings</b>                       | <b>377 kWh per household</b> |

Econoler considered these parameters reliable and conservative. On its website, NRCAN promotes the installation of low-flow showerheads<sup>21</sup>. NRCAN specifies that the flow of these showerheads ranges from as low as 3.8 litres per minute to 9.5 litres per minute, the most common type having an average flow of around five litres per minute. This value is close to what the OPA used in its assumption for a typical low-flow showerhead rate. Using its assumptions, NRCAN calculates an annual savings value of 377 kWh per household, similar to the OPA's.

Econoler calculated the energy savings achieved due to the installation of low-flow showerheads only when the energy source for domestic water heating was electricity. Otherwise, Econoler set the unitary

<sup>21</sup> Natural Resources Canada, Personal: Residential – Better Water Use Means Bigger Savings, <http://www.oee.nrcan.gc.ca>, date modified: 2009-06-26.



savings to zero. Finally, since the average number of showerheads installed through the program was equal to 1.11 units per household<sup>22</sup>, Econoler concluded that the annual savings value of 377 kWh could be used as a unitary savings value per low-flow showerhead.

#### **4.2.16 Pipe Insulation**

The Low Income program and the First Nation pilot project proposed the installation of water heater pipe insulation for households where the domestic hot water was heated electrically. For this product, ENSC used a unitary savings value of 74 kWh per year per 10 feet of insulated pipe, based on the 2009 impact evaluation report of the Low Income Homeowner program. Initially, the annual savings value used by ENSC assumed that pipe insulation was installed on a 1.5-inch pipe. In 2009, the evaluation revised the savings value to use a 0.75-inch pipe, which was considered as more common in residential applications. Econoler maintained this unitary savings value of 74 kWh per year since it was consistent with the insulated pipe size found in the OPA report. In addition, the Evaluator calculated savings for this product only when the energy used for domestic water heating was electricity.

#### **4.2.17 Hot Water Tank Wraps**

Hot water tank wraps were installed in houses where the domestic hot water was heated electrically through the program as well as through the First Nation pilot project. For this product, ENSC used a unitary savings value of 399 kWh per year. This savings value was based on the 2009 impact evaluation report of the Low Income Homeowner program.

As a second source, Econoler consulted the OPA report. The 2011 version of the report looked into the installation of water heater blankets in the residential market. The annual unitary savings for both single- and multi-family households were estimated at 270 kWh. Since the assumptions used by the OPA to estimate this unitary savings value were clear, well documented and reliable, Econoler used the unitary savings value of 270 kWh per year for this evaluation.

Under this program evaluation, the Evaluator calculated savings for hot water tank wraps only when the energy used for domestic water heating was electricity.

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<sup>22</sup> In 2011, a total of 2,058 low-flow showerheads were installed in 1,852 households under the Low Income program.

#### **4.2.18 Energy-to-Demand Ratio**

Econoler calculated the demand savings for the Low Income program based on an energy-to-demand ratio of 4.68 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings (in GWh) by the target peak demand savings (in MW).

#### **4.2.19 Revised Gross Savings**

The annual gross savings for the Low Income program are presented in the table below. Energy and demand savings for the program were revised to reflect the calibrated savings per EnerGuide rating point and the savings from prescriptive measures presented previously in Section 4.2. Overall, total gross energy and demand savings amount to 7.387 GWh and 1.578 MW at the meter.

At the generator level, total gross energy and demand savings are estimated at 8.163 GWh and 1.744 MW, using a line loss factor between the meter and the generator of 1.050. This value was provided by ENSC.

**Table 27: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                           | Savings per EnerGuide Point* | 13 Watt CFLs  | 23 Watt CFLs | Specialty CFLs | Flush-Mount CFLs | CFL Porch Lights | CFL Torchieres | LED Night-lights | Program-mable Thermostats | Electric Kettles | Power Bars with Timer |
|------------------------------------------------------------|------------------------------|---------------|--------------|----------------|------------------|------------------|----------------|------------------|---------------------------|------------------|-----------------------|
| <b>Energy Savings</b>                                      |                              |               |              |                |                  |                  |                |                  |                           |                  |                       |
| Number of Units from Low Income Tracking Sheets            | 319                          | 72,276        | 8,420        | 258            | 65               | 89               | 157            | 7,581            | 1,299                     | 1,409            | 837                   |
| Number of Units from the First Nation Direct Install Pilot | --                           | 1,600         | 442          | --             | --               | --               | --             | --               | --                        | 85               | 134                   |
| Total Number of Units                                      | <b>319</b>                   | <b>73,876</b> | <b>8,862</b> | <b>258</b>     | <b>65</b>        | <b>89</b>        | <b>157</b>     | <b>7,581</b>     | <b>1,299</b>              | <b>1,494</b>     | <b>971</b>            |
| Unitary Savings (kWh)                                      | 817                          | 46.3          | 69.5         | 49.8           | 49.8             | 49.8             | 69.5           | 29.3             | 221                       | 49               | 53                    |
| <b>Total Gross Energy Savings – at the Meter (GWh)</b>     | <b>0.855</b>                 | <b>3.420</b>  | <b>0.616</b> | <b>0.013</b>   | <b>0.003</b>     | <b>0.004</b>     | <b>0.011</b>   | <b>0.222</b>     | <b>0.287</b>              | <b>0.073</b>     | <b>0.051</b>          |
| Line Loss Factor                                           | 1.105                        | 1.105         | 1.105        | 1.105          | 1.105            | 1.105            | 1.105          | 1.105            | 1.105                     | 1.105            | 1.105                 |
| <b>Total Gross Energy Savings – at the Generator (GWh)</b> | <b>0.945</b>                 | <b>3.780</b>  | <b>0.681</b> | <b>0.014</b>   | <b>0.004</b>     | <b>0.005</b>     | <b>0.012</b>   | <b>0.245</b>     | <b>0.317</b>              | <b>0.081</b>     | <b>0.057</b>          |
| <b>Demand Savings</b>                                      |                              |               |              |                |                  |                  |                |                  |                           |                  |                       |
| Energy-to-Demand Ratio                                     | 4.68                         | 4.68          | 4.68         | 4.68           | 4.68             | 4.68             | 4.68           | 4.68             | 4.68                      | 4.68             | 4.68                  |
| <b>Total Gross Demand Savings – at the Meter (MW)</b>      | <b>0.183</b>                 | <b>0.731</b>  | <b>0.132</b> | <b>0.003</b>   | <b>0.001</b>     | <b>0.001</b>     | <b>0.002</b>   | <b>0.047</b>     | <b>0.061</b>              | <b>0.016</b>     | <b>0.011</b>          |
| Line Loss Factor                                           | 1.105                        | 1.105         | 1.105        | 1.105          | 1.105            | 1.105            | 1.105          | 1.105            | 1.105                     | 1.105            | 1.105                 |
| <b>Total Gross Demand Savings – at the Generator (MW)</b>  | <b>0.202</b>                 | <b>0.808</b>  | <b>0.145</b> | <b>0.003</b>   | <b>0.001</b>     | <b>0.001</b>     | <b>0.003</b>   | <b>0.052</b>     | <b>0.068</b>              | <b>0.017</b>     | <b>0.012</b>          |

\* In the "Savings per EnerGuide Point" column, the number of units is in fact the number of participants where a D audit was conducted and for which the Evaluator calculated savings per EnerGuide point. The unitary savings value shown in this column is the savings per EnerGuide point figure calculated through the EEH program impact evaluation.

| Product Category                                           | Dehumidifier Replacement | New Dehumidifiers | Fridge Replacement | Freezer Replacement | Fridge Retirement | Freezer Retirement | Faucet Aerators | Low-Flow Showerheads | Pipe Insulation | Hot Water Tank Wraps |
|------------------------------------------------------------|--------------------------|-------------------|--------------------|---------------------|-------------------|--------------------|-----------------|----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                      |                          |                   |                    |                     |                   |                    |                 |                      |                 |                      |
| Number of units from Low Income Tracking Sheets            | 18                       | 33                | 120                | 157                 | 14                | 4                  | 2,785           | 1,249                | 1,643           | 1,758                |
| Number of Units from the First Nation Direct Install Pilot | --                       | --                | --                 | --                  | --                | --                 | 7               | 21                   | 92              | 98                   |
| Total Number of Units                                      | <b>18</b>                | <b>33</b>         | <b>120</b>         | <b>157</b>          | <b>14</b>         | <b>4</b>           | <b>2,792</b>    | <b>1,270</b>         | <b>1,735</b>    | <b>1,856</b>         |
| Unitary Savings (kWh)                                      | 686                      | 0                 | 817                | 637                 | 1,016             | 1,274              | 176.3           | 377                  | 74              | 270                  |
| <b>Total Gross Energy Savings – at the Meter (GWh)</b>     | <b>0.012</b>             | <b>0.000</b>      | <b>0.098</b>       | <b>0.100</b>        | <b>0.014</b>      | <b>0.005</b>       | <b>0.492</b>    | <b>0.479</b>         | <b>0.128</b>    | <b>0.501</b>         |
| Line Loss Factor                                           | 1.105                    | 1.105             | 1.105              | 1.105               | 1.105             | 1.105              | 1.105           | 1.105                | 1.105           | 1.105                |
| <b>Total Gross Energy Savings – at the Generator (GWh)</b> | <b>0.014</b>             | <b>0.000</b>      | <b>0.108</b>       | <b>0.111</b>        | <b>0.016</b>      | <b>0.006</b>       | <b>0.544</b>    | <b>0.529</b>         | <b>0.142</b>    | <b>0.554</b>         |
| <b>Demand Savings</b>                                      |                          |                   |                    |                     |                   |                    |                 |                      |                 |                      |
| Energy-to-Demand Ratio                                     | 4.68                     | 4.68              | 4.68               | 4.68                | 4.68              | 4.68               | 4.68            | 4.68                 | 4.68            | 4.68                 |
| <b>Total Gross Demand Savings – at the Meter (MW)</b>      | <b>0.003</b>             | <b>0.000</b>      | <b>0.021</b>       | <b>0.021</b>        | <b>0.003</b>      | <b>0.001</b>       | <b>0.105</b>    | <b>0.102</b>         | <b>0.027</b>    | <b>0.107</b>         |
| Line Loss Factor                                           | 1.105                    | 1.105             | 1.105              | 1.105               | 1.105             | 1.105              | 1.105           | 1.105                | 1.105           | 1.105                |
| <b>Total Gross Demand Savings – at the Generator (MW)</b>  | <b>0.003</b>             | <b>0.000</b>      | <b>0.023</b>       | <b>0.024</b>        | <b>0.003</b>      | <b>0.001</b>       | <b>0.116</b>    | <b>0.113</b>         | <b>0.030</b>    | <b>0.118</b>         |

## 4.3 INTERACTIVE EFFECTS

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as space heating and cooling equipment. In the case of the Low Income program, replacement of lighting products with CFLs or LEDs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, a CFL and LED release less heat than the less efficient lamp they replace.

For the CFL and LED products installed either through the Low Income program or through the First Nation pilot project, an interactive effects factor of -9.8 percent was used in this year's evaluation. To calculate this factor, Econoler based its assessment on a study conducted by ADS in 1992 for Hydro-Québec.<sup>23</sup> The work done in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2<sup>24</sup> software and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high. The scenario with minimum interactive effects was selected for 2011 program impact calculations because it enabled the Evaluator to account for the evolution of construction practices in the residential sector since 1992.

Then, the Evaluator adjusted the interactive effects factors from the ADS study using the proportion of space heating provided by electric systems among Low Income program participants. The program tracking sheet showed the primary energy source used for space heating of each program participant (electricity, oil, natural gas, wood pellets, etc.). Econoler thus calculated the average percentage of electric heating in those participant houses, which resulted in 18 percent of program participant households being mainly heated with electric heating systems.<sup>25</sup> For electrically heated houses, Econoler assumed that the overall efficiency of electric heating systems would be 100 percent, which is a typical value used for electric baseboards. No interactive effect was considered on space heating for all other houses which were primarily heated with non-electric systems.

To take into account interactive effects on space cooling, Econoler adjusted the interactive effects factor in relation with the proportion of houses that had air conditioning units or systems installed. This

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<sup>23</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

<sup>24</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>25</sup> For this calculation, 5,090 of the 5,103 participants in the Low Income program had their primary space heating fuel clearly identified in the tracking sheet (all the empty cells and the "Other," "N/A" and "?" entries were removed from this calculation). A total of 906 participant households from the 5,090 were mainly heated with electric systems.

percentage was taken from Statistics Canada,<sup>26</sup> which states that 18 percent of households have air conditioning in their residence.

The following table presents the calculation details of the interactive effects. It shows the proportion of residences in Nova Scotia that are mainly heated by electricity and those that have air conditioning units or systems.

**Table 28: Interactive Effects Factor for CFLs, CFL Torchieres and LED Nightlights**

| Parameters                                   | % of Residences             | Interactive Effects |
|----------------------------------------------|-----------------------------|---------------------|
| Electric Heating with Air Conditioning       | $18\% \times 18\% = 3.2\%$  | -54.4%              |
| Electric Heating without Air Conditioning    | $18\% \times 82\% = 14.8\%$ | -58.0%              |
| No Electric Heating with Air Conditioning    | $82\% \times 18\% = 14.8\%$ | 3.6%                |
| No Electric Heating without Air Conditioning | $82\% \times 82\% = 67.2\%$ | 0.0%                |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                 | <b>-9.8%</b>        |

For pipe insulation and hot water tank wraps installed through the Low Income program and First Nation pilot projects, interactive effects of -100 percent were considered during the heating period in electrically heated houses. This estimation is based on the fact that, when there is no insulation, all the heat lost through the pipes and the hot water tank is released into the room. Assuming that the pipes and tank are located in a heated room, it means that 100 percent of the energy released from the hot water is used for the heating load. Conversely, during the cooling period, interactive effects are estimated at +100 percent in houses that use air conditioning. Based on the heating and cooling degree-days for the region of Halifax<sup>27</sup>, Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation.

<sup>26</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

<sup>27</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.

The table below presents the details for such a calculation. As for lighting products, the table shows the proportion of residences in Nova Scotia that are heated electrically and those that use air conditioning units or systems, which results in a weighted interactive effects factor of -9.0 percent.

**Table 29: Interactive Effects Factor for Pipe Insulation and Hot Water Tank Wraps**

| Parameters                                   | % of Residences             | Interactive Effects During Heating Period | Interactive Effects During Cooling Period |
|----------------------------------------------|-----------------------------|-------------------------------------------|-------------------------------------------|
| Electric Heating with Air Conditioning       | $18\% \times 18\% = 3.2\%$  | $-100\% \times 8/12 = -66.7\%$            | $+100\% \times 2/12 = 16.7\%$             |
| Electric Heating without Air Conditioning    | $18\% \times 82\% = 14.8\%$ | $-100\% \times 8/12 = -66.7\%$            | $0\% \times 2/12 = 0\%$                   |
| No Electric Heating with Air Conditioning    | $82\% \times 18\% = 14.8\%$ | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = 16.7\%$             |
| No Electric Heating without Air Conditioning | $82\% \times 82\% = 67.2\%$ | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>   | <b>100%</b>                 | <b>-12.0%</b>                             | <b>3.0%</b>                               |
|                                              |                             | <b>-9.0%</b>                              |                                           |

For all other products installed, interactive effects were considered as negligible.

## 4.4 NET-TO-GROSS RATIO

The Low Income program offers free energy audits and implementation of energy efficiency measures for low-income homeowners. Due to the nature of the measures proposed and the target customers, the distortion effects of the program are assumed to be insignificant. Consequently, the NTGR is assumed to be 1 for this program.

## 4.5 NET SAVINGS

The net savings for the program were estimated using the interactive effects factors and the NTGR above. The equation below was used to calculate the net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

The results obtained are presented in the next table. Overall, the total net energy and demand savings for the Low Income program amount to 6.910 GWh and 1.477 MW at the meter, and 7.636 GWh and 1.632 MW at the generator.

**Table 30: Evaluation Results – Gross and Net Savings**

| Product Category                                     | Savings<br>per<br>EnerGuide<br>Point | 13 Watt<br>CFLs | 23 Watt<br>CFLs | Specialty<br>CFLs | Flush-<br>Mount<br>CFLs | CFL<br>Porch<br>Lights | CFL Tor-<br>chieres | LED<br>Night-<br>lights | Program-<br>mable<br>Thermos-<br>tats | Electric<br>Kettles | Power<br>Bars with<br>Timer |
|------------------------------------------------------|--------------------------------------|-----------------|-----------------|-------------------|-------------------------|------------------------|---------------------|-------------------------|---------------------------------------|---------------------|-----------------------------|
| Energy Savings                                       |                                      |                 |                 |                   |                         |                        |                     |                         |                                       |                     |                             |
| Total Gross Energy Savings –<br>at the Meter (GWh)   | 0.855                                | 3.420           | 0.616           | 0.013             | 0.003                   | 0.004                  | 0.011               | 0.222                   | 0.287                                 | 0.073               | 0.051                       |
| Interactive Effects Factor                           | 0%                                   | -9.8%           | -9.8%           | -9.8%             | -9.8%                   | -9.8%                  | -9.8%               | -9.8%                   | 0%                                    | 0%                  | 0%                          |
| NTGR                                                 | 1.00                                 | 1.00            | 1.00            | 1.00              | 1.00                    | 1.00                   | 1.00                | 1.00                    | 1.00                                  | 1.00                | 1.00                        |
| Total Net Energy Savings<br>(GWh) – at the Meter     | 0.855                                | 3.085           | 0.556           | 0.012             | 0.003                   | 0.004                  | 0.010               | 0.200                   | 0.287                                 | 0.073               | 0.051                       |
| Line Loss Factor                                     | 1.105                                | 1.105           | 1.105           | 1.105             | 1.105                   | 1.105                  | 1.105               | 1.105                   | 1.105                                 | 1.105               | 1.105                       |
| Total Net Energy Savings<br>(GWh) – at the Generator | 0.945                                | 3.409           | 0.614           | 0.013             | 0.003                   | 0.004                  | 0.011               | 0.221                   | 0.317                                 | 0.081               | 0.057                       |
| Demand Savings                                       |                                      |                 |                 |                   |                         |                        |                     |                         |                                       |                     |                             |
| Total Gross Demand Savings –<br>at the Meter (MW)    | 0.183                                | 0.731           | 0.132           | 0.003             | 0.001                   | 0.001                  | 0.002               | 0.047                   | 0.061                                 | 0.016               | 0.011                       |
| Interactive Effects Factor                           | 0%                                   | -9.8%           | -9.8%           | -9.8%             | -9.8%                   | -9.8%                  | -9.8%               | -9.8%                   | 0%                                    | 0%                  | 0%                          |
| NTGR                                                 | 1.00                                 | 1.00            | 1.00            | 1.00              | 1.00                    | 1.00                   | 1.00                | 1.00                    | 1.00                                  | 1.00                | 1.00                        |
| Total Net Demand Savings<br>(MW) – at the Meter      | 0.183                                | 0.659           | 0.119           | 0.002             | 0.001                   | 0.001                  | 0.002               | 0.043                   | 0.061                                 | 0.016               | 0.011                       |
| Line Loss Factor                                     | 1.105                                | 1.105           | 1.105           | 1.105             | 1.105                   | 1.105                  | 1.105               | 1.105                   | 1.105                                 | 1.105               | 1.105                       |
| Total Net Demand Savings<br>(MW) – at the Generator  | 0.202                                | 0.728           | 0.131           | 0.003             | 0.001                   | 0.001                  | 0.002               | 0.047                   | 0.068                                 | 0.017               | 0.012                       |



| Product Category                                         | Dehumidifier Replacements | New Dehumidifiers | Fridge Replacements | Freezer Replacements | Fridge Retirements | Freezer Retirements | Faucet Aerators | Low-Flow Showerheads | Pipe Insulation | Hot Water Tank Wraps |
|----------------------------------------------------------|---------------------------|-------------------|---------------------|----------------------|--------------------|---------------------|-----------------|----------------------|-----------------|----------------------|
| <b>Energy Savings</b>                                    |                           |                   |                     |                      |                    |                     |                 |                      |                 |                      |
| Total Gross Energy Savings – at the Meter (GWh)          | 0.012                     | 0                 | 0.098               | 0.100                | 0.014              | 0.005               | 0.492           | 0.479                | 0.128           | 0.501                |
| Interactive Effects Factor                               | 0%                        | 0%                | 0%                  | 0%                   | 0%                 | 0%                  | 0%              | 0%                   | -9.0%           | -9.0%                |
| NTGR                                                     | 1.00                      | 1.00              | 1.00                | 1.00                 | 1.00               | 1.00                | 1.00            | 1.00                 | 1.00            | 1.00                 |
| <b>Total Net Energy Savings (GWh) – at the Meter</b>     | <b>0.012</b>              | <b>0</b>          | <b>0.098</b>        | <b>0.100</b>         | <b>0.014</b>       | <b>0.005</b>        | <b>0.492</b>    | <b>0.479</b>         | <b>0.117</b>    | <b>0.456</b>         |
| Line Loss Factor                                         | 1.105                     | 1.105             | 1.105               | 1.105                | 1.105              | 1.105               | 1.105           | 1.105                | 1.105           | 1.105                |
| <b>Total Net Energy Savings (GWh) – at the Generator</b> | <b>0.014</b>              | <b>0</b>          | <b>0.108</b>        | <b>0.111</b>         | <b>0.016</b>       | <b>0.006</b>        | <b>0.544</b>    | <b>0.529</b>         | <b>0.129</b>    | <b>0.504</b>         |
| <b>Demand Savings</b>                                    |                           |                   |                     |                      |                    |                     |                 |                      |                 |                      |
| Total Gross Demand Savings – at the Meter (MW)           | 0.003                     | 0                 | 0.021               | 0.021                | 0.003              | 0.001               | 0.105           | 0.102                | 0.027           | 0.107                |
| Interactive Effects Factor                               | 0%                        | 0%                | 0%                  | 0%                   | 0%                 | 0%                  | 0%              | 0%                   | -9.0%           | -9.0%                |
| NTGR                                                     | 1.00                      | 1.00              | 1.00                | 1.00                 | 1.00               | 1.00                | 1.00            | 1.00                 | 1.00            | 1.00                 |
| <b>Total Net Demand Savings (MW) – at the Meter</b>      | <b>0.003</b>              | <b>0</b>          | <b>0.021</b>        | <b>0.021</b>         | <b>0.003</b>       | <b>0.001</b>        | <b>0.105</b>    | <b>0.102</b>         | <b>0.025</b>    | <b>0.097</b>         |
| Line Loss Factor                                         | 1.105                     | 1.105             | 1.105               | 1.105                | 1.105              | 1.105               | 1.105           | 1.105                | 1.105           | 1.105                |
| <b>Total Net Demand Savings (MW) – at the Generator</b>  | <b>0.003</b>              | <b>0</b>          | <b>0.023</b>        | <b>0.024</b>         | <b>0.003</b>       | <b>0.001</b>        | <b>0.116</b>    | <b>0.113</b>         | <b>0.028</b>    | <b>0.108</b>         |

The net energy savings resulting from this evaluation were compared to the energy savings estimations from the 2011 tracking sheet. The next table details the final evaluated and tracked impacts for 2011.

**Table 31: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 7.082 GWh             | 7.082 GWh                              | 1.00        | 7.082 GWh        |
| <b>Evaluation Results</b> | <b>8.163 GWh</b>      | <b>7.636 GWh</b>                       | <b>1.00</b> | <b>7.636 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 1.513 MW              | 1.513 MW                               | 1.00        | 1.513 MW         |
| <b>Evaluation Results</b> | <b>1.744 MW</b>       | <b>1.632 MW</b>                        | <b>1.00</b> | <b>1.632 MW</b>  |

As shown in the above table, the evaluated net energy and demand savings were higher than those calculated by ENSC. The difference between the tracked and evaluated results can be explained by the revision or the addition of the following parameters:

- > Unitary savings values: For several products, the unitary savings values were revised upward. The adjustment for programmable thermostats was the most important since the baseline, previously estimated as standard electronic thermostats, was reviewed to bimetallic thermostats. For faucet aerators and low-flow showerheads, the unitary savings values were also increased significantly. For 13 watt and 23 watt CFLs, the unitary savings values were increased by 13 and 17 percent, respectively. Even if these adjustments were not as significant as for other products, they significantly impacted the realization rate because of the large number of CFLs installed through the program (more than 80,000 units). On the other hand, the unitary savings values of CFL torchieres, hot water tank wraps as well as for refrigerator and freezer replacements were revised downward. These four measures, however, accounted for a small percentage of the total program impacts and thus affected the realization rate to a small extent. Finally, the reduction of energy savings per EnerGuide point increase (from 1,047 to 817 kWh per EnerGuide point) did not have a relevant impact on overall gross savings. The rationale behind this is that only a limited number of participants (319) had their houses improved through the EcoENERGY program when compared to the total program population (more than 5,000 participants).
- > Interactive effects factors: Interactive effects were not taken into account in the program tracking sheet. However, Econoler considered that the interactive effects on space heating and cooling loads caused by lighting product replacements, pipe insulation and hot water tank wraps were not negligible. Interactive effects factors were estimated for these products and

used in the net savings calculations. These interactive effects factors reduced significantly the net energy and demand savings of the program.

- > **Line loss factor:** In the tracking sheet, ENSC used a line loss factor of 1.1188, as in the 2010 evaluations for residential programs. The line loss factor for the residential sector was updated this year to 1.105.

The upward revision of the unitary savings values for CFL products, as well as for programmable thermostats, faucet aerators and low-flow showerheads, significantly increased the gross savings calculated for the Low Income program (the difference between the evaluated savings and the tracked values was approximately 15%). Despite these adjustments, the net energy and demand savings evaluated by Econoler were only 8 percent higher than those tracked by ENSC since the Evaluator used interactive effects factors for the calculation of the net program impacts.

Upon completion of the impact evaluation, Econoler identified a series of opportunities for improving future impact calculations. Accordingly, Econoler recommends to:

- > **Assess the installation rate of certain prescriptive measures:** In 2011, only three on-site visits were conducted under the program evaluation process. These visits aimed at evaluating the procedure and the ecoEnergy protocol that the energy advisors had to follow during the audits. The savings related to the increase of EnerGuide point accounted for only 13 percent of total program energy savings, the remaining proportion being due to the prescriptive measures or the energy efficiency products directly installed on site (including those installed through the First Nation pilot project). With this in mind, Econoler believes that on-site visits aiming at validating the installation rate of the Direct Install products should be performed under future project evaluations.
- > **Review HOT2000 models on a random basis:** The Evaluator or the PM should revise a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.
- > **Ensure the final audits are completed after the implementation of measures:** In the 2011 final tracking sheet, the vast majority of projects had not yet had their final audit completed. ENSC explained that this situation was exceptional. Indeed, the fact that the Federal Government came back into EnerGuide and the Team Buy Initiatives organized for the EnerGuide for Existing Houses (EEH) program caused an increase in the number of participants in 2011 for both Low Income and EEH programs. As a result, auditors became very busy in performing initial audits and important delays occurred for the completion of final audits. For these projects, ENSC used the projected E EnerGuide rating and a realization rate

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of 75 percent to calculate the savings related to the increase of EnerGuide point, which should normally only be used as a temporary estimate. ENSC should ensure that the DAs have sufficient staff and a protocol in place that would allow ensuring that all final audits are completed within a short period after the measures are implemented.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Revise the current process flow chart found in the program manual:</b> The program process flow chart illustrated in the program manual contains names of individuals in some places. The Evaluator recommends changing the name to a function. Furthermore, the audit should be referred to as an EnerGuide audit to clarify the type of audit and the reference to Scope II measures that currently appears at the end of the illustration could be mentioned further up in the process flow chart.                                                                                                                                                                                                                                                                                                  |
|                               | <b>2. Mention the EnerGuide audit and trainer activities:</b> The program manual neither mentions the energy audits that are performed in each house prior to implementing any measure nor does it cover the training activities offered by the DA to the auditors. These different steps are an important part of the participation process and should be documented in the manual.                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                               | <b>3. Monitor outreach activities:</b> The Evaluator recommends that outreach activities be monitored with performance indicators to evaluate the effectiveness of each activity in terms of enrolment in the program.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               | <b>4. Provide a “base case”:</b> The program manual does not provide a “base case” that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                               |
|                               | <b>5. Provide the parameters used to estimate the program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b>            | <p><b>6. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information is missing to serve as “program memory” in case of modifications or staff changes. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Program Tracking Sheet</b>            | <p><b>7. Add complementary information:</b> To help keep track of the unitary savings, the actual unitary savings value for each prescriptive measure should be referred to in another table instead of entering the value directly in the formula. This will allow for a better understanding of the savings calculations and the monitoring of the unitary savings in case of future modifications.</p> <p><b>8. Standardize the entries:</b> To avoid entering the same information in different ways and to reduce the number of data entry errors, ENSC should integrate a drop-down list of answers when possible. For instance, the space heating sources are identified in many different ways in the tracking sheet. By entering data with the help of a drop-down menu, the treatment of data for evaluation purposes will be more efficient.</p> <p><b>9. Implement a verification protocol:</b> A quick validation process should be developed and applied to the tracking sheet to flag inconsistencies and missing entries. There were a few entries in the tracking sheet that showed inconsistencies. In a few cases, the tracking sheet indicated that the house was not using any electricity for space heating (0 percent for electric heating) while other fields indicated that the primary or secondary source for space heating was electricity.</p> <p><b>10. Create fields for building energy consumption data:</b> Currently, the energy savings are in part calculated using the EnerGuide ratings. It would be suitable and more accurate to calculate them with the energy consumption data of HOT2000. Econoler proposes adding fields for building energy consumption per year in kWh for D and E audits.</p> |
| <b>Program Design and Implementation</b> | <p><b>11. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Design and Implementation</b> | <p><b>12. Address the confusion around the program name:</b> The program has carried a few names through its existence (Low Income program and Low Income Homeowners). It was also integrated with the REAP program. According to program partners, the different name changes that occurred have created confusion among participants. Marketing research conducted by NSPI when the program was initiated found that the present program name (Low Income) was preferred because it was clear and explicit. Therefore, Econoler recommends addressing the confusion around the program name and putting forth effort to eliminate confusion in the market..</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>On-Sites Visits</b>                   | <p><b>13. Explain in detail the protocol to the clients:</b> The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations). Participants may have difficulties understanding a number of these concepts. In addition, providing the participants with more details on the program allows them to consider other energy-saving opportunities (if any) than those proposed and selected for implementation through the D audit process.</p> <p><b>14. Spend more time explaining the basics of household energy use:</b> Successful implementation of a residential energy efficiency project relies greatly on occupants' comprehension of the project and its potential impacts. Energy advisor should therefore spend some time on site for explaining the household energy consumption and minimum energy savings basics to the participants. During on-site visits, energy advisors could, for instance, explain the household energy consumption as a whole, including the fact that potential energy efficiency measures may have relevant side effects on occupants' comfort and health. Additionally, further information on air leakage reduction and the related potential benefits (energy savings, comfort improvement) should be provided to the participants, especially because this issue represents a high energy savings potential in low-income households when compared to typical residential buildings.</p> |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On-Sites Visits</b>            | <p><b>15. Encourage the energy advisor to provide participants with booklets:</b> Under its ecoENERGY program, NRCan developed a series of booklets for homeowners aiming to explain energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide “Keeping the Heat In”). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants adopting energy-wise habits. Furthermore, the general maintenance level of low-income households is usually lower than that of average households. Therefore, Econoler believes that providing the program participants with documentation on good maintenance practices, along with the related benefits (energy savings, comfort improvement, increased value of the property), would be another opportunity for improving the energy efficiency of low-income residential buildings.</p> |
| <b>Relationship with Partners</b> | <p><b>16. Improve program communications:</b> In order to improve the program, program partners recommend lowering the number of organizations involved in the program. According to them, it would not only reduce communication problems among the organizations and the time it takes to process submission files, but it would also minimize the confusion among homeowners as to which organization is handling their file. Similarly, the OA suggests improving the program with better communication with the DA so that the OA can roughly inform people on when they could expect their work to be done. If the DA had a scheduling database and the OA had online access to it, it could be possible to validate when the DA would likely contact a participant and inform the latter. Moreover, the OA declared not always having the information needed to fully answer questions from participants.</p>                                                                                |
| <b>Impact Evaluation</b>          | <p><b>17. Assess the installation rate of certain prescriptive measures:</b> In 2011, only three on-site visits were conducted under the program evaluation process. These visits aimed at evaluating the procedure and the ecoEnergy protocol that the energy advisors had to follow during the audits. The savings related to the increase of EnerGuide points accounted for only 13 percent of total program energy savings, the remaining proportion being due to the prescriptive measures or the energy efficiency products directly installed on site (including those installed through the First Nation pilot project). With this in mind, Econoler believes that on-site visits aiming at validating the installation rate of the Direct Install products should be performed under future project evaluations.</p>                                                                                                                                                                       |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Impact<br>Evaluation | <p><b>18. .Review HOT2000 models on a random basis:</b> The Evaluator or the PM should review a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor. In addition, the PM should target projects with outlier values, such as an initial EnerGuide rating below 20 or an increase of the EnerGuide rating by more than 40 points.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                      | <p><b>19. Ensure the final audits are completed after the implementation of measures:</b> In the 2011 final tracking sheet, the vast majority of projects had not yet had their final audit completed. ENSC explained that this situation was exceptional. Indeed, the fact that the Federal Government came back into EnerGuide coupled with the Team Buy Initiatives organised for the EnerGuide for Existing Houses (EEH) program, caused an increase in the number of participants during the first months of 2011 for both Low Income and EEH programs. As a result, auditors became very busy in performing initial audits and important delays occurred for the completion of final audits. For these projects, ENSC used the projected E EnerGuide rating and a realization rate of 75 percent to calculate the savings related to the increase of EnerGuide point, which should normally only be used as a temporary estimate. ENSC should ensure that the DAs have sufficient staff and a protocol in place that would allow ensuring that all final audits are completed within a short period after the measures are implemented.</p> |

## APPENDIX II - PROGRAM THEORY

| Low Income Households                                                                          |                                                                                                                                                                                                                                            |                                                                                                                                          |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                                                                                            |                                                                                                                                          |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                                                                                            |                                                                                                                                          |
| #                                                                                              | Program Theory                                                                                                                                                                                                                             | Performance Indicators                                                                                                                   |
| 1                                                                                              | Natural Resources Canada (NRCan) has to select delivery agents (DAs) to make sure that the program protocol is adequately applied for quality control purposes. Once the agents are selected it signs a delivery agreement with NRCan.     | List of approved agents in the province.                                                                                                 |
| 2                                                                                              | The DA has to train its energy auditors to use the simulation software HOT2000 and other aspects of the energy audit such as the blower door test, etc.                                                                                    | Record of training session along with places, names of trainees, dates and evaluation forms.                                             |
| 3                                                                                              | Several organizations are cooperating with ENSC to provide referrals and leads of low-income potential participants who are then referred to the DA. Among them, SNSMR, DCS, Outreach Agents. Additionally, homeowners can apply directly. | Records of leads from each organization.                                                                                                 |
| 4                                                                                              | After participant enrollment, the energy auditor will perform a pre-retrofit audit identifying savings and their cost-effectiveness.                                                                                                       | Standard audit report as prescribed by NRCan with nominal information and authorization for other organizations to make further contact. |
| 5                                                                                              | The recommended measures from the audit report are sent to ENSC for approval before implementation.                                                                                                                                        | Track record of measures approved for each participant.                                                                                  |

| Low Income Households                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                             |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                             |
| #                                                                                              | Program Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Performance Indicators                                                                                                                                                                                                                                      |
| 6                                                                                              | Once the decision is made, the DA implements itself, or through a building contractor, all or some of the measures recommended in the audit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Compilation of the list of measures each participant has implemented along with their deemed savings.                                                                                                                                                       |
| 7                                                                                              | Depending on the nature of the measures, participants have access to three organizations that could offer incentives depending on the nature of the measures. ENSC provides incentives for specific equipment related to electric space and water heating. The provincial government provides incentives for envelope measures while NRCan provides an incentive for a pre-approved set of measures. NRCan is responsible for its own activities while ENSC acts as a single window for electricity savings measures as well as other energy-saving measures. The first is funded by ratepayers and the second by taxpayers. | Track record of payments for electricity measures paid by ratepayers.<br>Track record of payments for other sources of energy savings paid by taxpayers.<br>Track record of EnerGuide audit number to cross-check multiple incentives for the same measure. |
| 8                                                                                              | Implementing the EE measure will reduce the energy bill.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Each measure has its own deemed savings along with the source or calculations for these savings. Double counting should be monitored.                                                                                                                       |
| 9                                                                                              | Eventually, the growing number of participants will result in increased confidence in the merits of EE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Participant statistics or the annual market penetration rate could be used as a performance indicator for this program.                                                                                                                                     |
| 10                                                                                             | Contractors that specialized in implementing EE measures will increase so that access to energy efficiency measures will be wider for market transformation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Keeping statistics on specialized contractors could be a proper indicator as to whether they are registered with the program.                                                                                                                               |

| Low Income Households                                                                          |                                                                                                                                                                       |                                                                                                                     |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Program Theory and Performance Indicators                                                      |                                                                                                                                                                       |                                                                                                                     |
| The following table explains the relationship between the different levels of the logic model. |                                                                                                                                                                       |                                                                                                                     |
| #                                                                                              | Program Theory                                                                                                                                                        | Performance Indicators                                                                                              |
| 11                                                                                             | Sustainable energy savings will occur in the long run resulting in a reduction of harmful emissions and in avoiding building new energy plants fueled by oil or coal. | The more houses go through this process, the more harmful emissions coming from thermal generation will be reduced. |

## APPENDIX III - DEMOGRAPHICS

Similar to previous years, the majority of respondents reside in detached single-family homes (71%). This year, just under three in 10 reside in a mobile home or house trailer (27%), which is an increase compared with 2010 results. One-half of respondents reside in a home with three bedrooms (49%), while a further two in 10 are in a home with 4 or more bedrooms (23%). One-quarter of respondents have two people living in their home full time (26%), while one-third have 3 or more (32 %). Finally, all respondents reside in their home year round. (D1, D2, D5, D6)

**Table 32: Residence**

| <b>Type of Home</b>                                 | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-----------------------------------------------------|-------------|-------------|-------------|
| <i>Sample size</i>                                  | 55          | 62          | 70          |
| Detached single-family home                         | 82%         | 69%         | 71%         |
| Mobile home or house trailer                        | 16          | 15          | 27          |
| Townhouse or duplex which share adjacent walls      | 2           | 2           | 1           |
| Apartment building that has fewer than five stories | --          | 6           | --          |
| Semi-detached house                                 | --          | 2           | --          |
| Other                                               | --          | 6           | --          |
| <b>Number of Bedrooms</b>                           | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample size</i>                                  | 55          | 62          | 70          |
| 1                                                   | 4%          | 10%         | 4%          |
| 2                                                   | 36          | 34          | 23          |
| 3                                                   | 49          | 42          | 49          |
| 4                                                   | 7           | 8           | 17          |
| 5                                                   | 4           | 3           | 6           |
| 6                                                   | --          | 2           | --          |
| Studio apartment                                    | --          | --          | 1           |
| Don't know/refused                                  | --          | 2           | --          |
| <b>Full-time Inhabitants</b>                        | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample size</i>                                  | 55          | 62          | 70          |
| 1                                                   | 56%         | 56%         | 43%         |
| 2                                                   | 33          | 27          | 26          |
| 3                                                   | 6           | 6           | 23          |
| 4 or more                                           | 6           | 10          | 9           |
| <b>Year round or Seasonal Home</b>                  | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample size</i>                                  | --          | --          | 70          |
| Year round residence                                | --          | --          | 100%        |

In terms of age distribution, the majority of respondents are 45 years of age or older (84%). Specifically, just over two in 10 are aged 45 to 54 (23%), one-third are aged 55 to 64 (34%), and under three in 10 are 65 years of age or older (27%). Similar to last year, two-thirds of respondents are female (67%), and one-third are male (33%). (D7, D10)

**Table 33: Age and Gender**

| <b>Age</b>         | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------|-------------|-------------|-------------|
| <i>Sample size</i> | 55          | 62          | 70          |
| 18 to 24           | 2%          | 0%          | 1%          |
| 25 to 34           | 4           | 3           | 6           |
| 35 to 44           | 7           | 10          | 9           |
| 45 to 54           | 24          | 29          | 23          |
| 55 to 64           | 33          | 23          | 34          |
| 65 or over         | 31          | 32          | 27          |
| Refused            | --          | 3           | --          |
| <b>Gender</b>      | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample size</i> | 55          | 62          | 70          |
| Female             | 62%         | 69%         | 67%         |
| Male               | 38          | 31          | 33          |

Similar to 2010 findings, four in 10 respondents have a high school diploma (43%), while two in 10 have less than a high school education (20%). In terms of income, just under three in 10 have a household income of less than \$15,000 (27%), which is a decrease compared with 2010 findings, while over four in 10 have a household income between \$15,000 and \$24,000 (44%). (D8, D9)

**Table 34: Education and Income**

| <b>Education</b>                                              | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------------------------------------------------|-------------|-------------|-------------|
| <i>Sample size</i>                                            | 55          | 62          | 70          |
| Less than high school graduation certificate                  | 53%         | 27%         | 20%         |
| High school graduation certificate and/or some post-secondary | 24          | 45          | 43          |
| Trades certificate or diploma                                 | 4           | 6           | 7           |
| College certificate or diploma                                | 13          | 11          | 14          |
| University certificate or diploma                             | 7           | 8           | 13          |
| Refused                                                       | --          | 2           | 2           |

| <b>Income</b>       | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------|-------------|-------------|-------------|
| <i>Sample size</i>  | 55          | 62          | 70          |
| Less than \$15,000  | 47%         | 40%         | 27%         |
| \$15,000 - \$24,999 | 31          | 31          | 44          |
| \$25,000 - \$34,999 | 7           | 5           | 13          |
| \$35,000 - \$49,999 | 2           | 2           | 1           |
| \$50,000 or more    | 2           | --          | --          |
| Refused             | 11          | 23          | 14          |

Nearly all respondents currently inhabit the same house as the house that was involved in the program. (P2)

**Table 35: Inhabiting Same House in Program**

| <b>Inhabiting Same House in Program</b> | <b>2011</b> |
|-----------------------------------------|-------------|
| <i>Sample size</i>                      | 70          |
| Yes                                     | 99%         |
| No                                      | 1           |

All respondents personally pay the electric bills for their home. (D4)

**Table 36: Pay Electric Bills**

| <b>Pay Electric Bills</b> | <b>2011</b> |
|---------------------------|-------------|
| <i>Sample size</i>        | 70          |
| Yes                       | 100%        |

## **APPENDIX IV - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Low Income Household**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: Evaluation report 2010</b> |
|---------------------------------------|

#### **Page II**

Q: Recommendation # LIH-R1 and LIH-R3: What is the status of this recommendation?

LIH-R2: What is the status of this recommendation?

#### **Page III**

Q: LIH-R9: What is the status of this recommendation?

Q: LIH-R10: What is the status of this recommendation?

#### **Page IV**

Q: LIH-R11 what is the status of this recommendation?

C: LIH-R12: The program changed name from REAP to the actual name. Care to comment?

Q: LIH-R13: What is the status of this recommendation?

LIH-F14: Is the refrigerator and freezers still included in the actual program? (From the Web site it doesn't seem so but from the program manual they are if they are of a certain age. If they are not included anymore, what is the reason?

Q: Scope I are mainly envelope measure and Scope II are prescriptive measures. Correct?



**Page V**

LIH-R17: What is the status of this recommendation?

LIH-R18: LIH-R18 : What is the status of this recommendation?

LIH-R19: (important): What is the status of this recommendation?

LIH-R20: What is the status of this recommendation?

**Page 2**

Q: The list of measures that are on that page were installed for free?

Q: This list has now been modified in the program manual, right?

**Page 3**

Who pays for measures for scope II? The province?

**Page 3**

Q: In the process of the two EnerGuide for houses, It's not clear what happens to those who are not electric? Care to explain?

Q: Is it the delivery agent who trains the energy auditors or NRCan?

Q: IN the program objectives, the reduction of arrears on their electricity bill is one of them?

**Page 7**

The logic model needs to be modified:

1. In the program activity line- there should be an arrow from the first bubble to the second since the delivery agents train the auditors.
2. In the Pre-retrofit evaluation bubble we should identify that's an EnerGuide audit.
3. In the output line – the third bubble should identify DSC and SNSMR as sources of referrals to delivery agents.
4. In the short-term outcomes there should be an arrow going from the first bubble (delivery agents.) to the first line data collection bubble.
5. Nowhere we see what happens to those who use fossil fuel that are funded by the provincial government.

**Source: Web site**

Q: The program changed names, as we understand it 4 times:

1. Residential Energy Affordability Program (REAP)
2. Low Income Direct Install
3. Low Income Household Program
4. And now, Low Income Homeowner

Care to comment?

Q: We understand that the qualifying measures have changed from last year, correct?

**Source Program Manual**

### **Page 3**

C: It is not easy to read who does what in the introduction section because of the electricity measures and fossil measures and who provides what in terms of incentives. We suggest a figure or flow chart to guide participants and program partners of the path to financial support for the different scenario.

The description on pages 5 to 7 is a little bit clearer but still a flow chart would do a lot of good understanding the process and who pays for what.

### **Page 9**

Q: Do you keep performance indicators for the activities of the Outreach Agents?

Q: The fact that you want to do annual process evaluation is because program components change often?

### **Page 10**

Q: ENSC breaks down the cost to separate from fossil fuel. Does that mean that you manage two budgets envelop one for each?

**Page 12 (CFL)**

C: # 3 Make sure that the lamp that are replaced were functioning before uninstall them.

C: # 6B: Identify the outdoor lamps because they are not subject to interactive effects (not clear if it's done from the protocol)

#6 d. Any particular reason to record this information? Is this for saturation purposes?

Q: Do you have a protocol for disposal of CFLs?

**Page 16**

C: All the protocols that have been added to the program manual are considered as good practice.

Q: Refrigerators and Freezers: These two items are still in the program but have to be eligible for replacement (older than 1990), correct?

Q: The replacement shall be Energy Star, are you also looking for the EnerGuide label?

**Page 17**

C: #7 iii: Location should also include "not close from a thermostat"

Q: Are you taking any pictures of the nameplates when possible?

**Page 58**

Q: What are the source s and assumptions for the presumed savings on that page?

**Page 60**

C: Just a few comments:

1. There should be no names in the chart (Josh notes question & concern)
2. The audit should be referred as an EnerGuide audit, because it is well known in terms of what kind of audit and software is used.
3. Scope 2 is mentioned only once at the bottom of the chart, not before. That seems strange. Care to comment?

**Participation Form**

This form has a revision date, which is a very good practice.

We haven't notice any reference to the second audit in the program manual?

|                |
|----------------|
| <b>General</b> |
|----------------|

Q: Why did Conserve Nova Scotia organization shut down in 2011?

Q: Please describe who are the program partners how many are they and their roles so we can ask the proper questions when we interview them for the process evaluation.

Q: Do you do a cost-effectiveness test post evaluation?

Q: When the program was initially designed was there an evaluation plan designed at the same moment?

Q: Do you have a written marketing strategy? And if yes do you collect performance indicators for the components of this strategy?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the different program partners (delivery agent and others)?

Thank you!

## **APPENDIX V - INTERVIEW GUIDE WITH DELIVERY AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Low-Income Households**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Low-Income Households Program**

**Q9 – We would like your opinion on the number of partners involved in this program other than you (auditors, outreach agents, service organizations, professional contractors).**

**Q9a- Other program partners like you. Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a1- If you answered Too Few or Too Many, please comment:**

**Q9b - We would like your opinion on the number of organizations other than ENSC involved in the program (Service Nova Scotia and Municipal Relations, NRCan, Department of Community Centers). Are they?**

- ☐ Too few
- ☐ Adequate



- ☐ Too many
- ☐ No opinion

**Q9b1- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners in this program (specify which ones)?**

Name of partner:

**Score:**

Name of partner:

**Score:**

Name of partner:

**Score:**

**Q10a – If any of your answers to Q8 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participants?**

**Q12- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

**Other program partners**

☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Other organizations involved in the program**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Q13- What is your opinion in regard to the program name that has changed many times since its first implementation (Residential Energy Affordability Program, Low-Income Households Program, Low-Income Home Owners)?**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

**Q15- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q15a- What was the complaint about?**

**Q16 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

**Q17 – In your opinion, do you believe that participants still expect the program to replace their refrigerators and freezers?**

- ☐ Yes
- ☐ No
- ☐ Don't Know

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX VI - INTERVIEW GUIDE WITH OUTREACH AGENT**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Low-Income Households**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, save the file and send it back at the following email address: szariffa@videotron.ca.

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Conserve Nova Scotia to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Low-Income Households Program**

**Q9 – We would like your opinion on the number of partners involved in this program other than you (auditors, delivery agents, service organizations, professional contractors).**

**Q9a- Other program partners like you. Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9a1- If you answered Too Few or Too Many, please comment:**

**Q9b - We would like your opinion on the number of organizations other than ENSC involved in the program (Service Nova Scotia and Municipal Relations, NRCan, Department of Community Centers). Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion

**Q9b1- If you answered Too Few or Too Many, please comment:**

**Q10- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners in this program (specify which ones)?**

Name of partner:

**Score:**

Name of partner:

**Score:**

Name of partner:

**Score:**

**Q10a – If any of your answers to Q8 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q11 – Who provides you with leads for potential participants?**

**Q12- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

**Other program partners**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know



**Other organizations involved in the program**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Q13- What is your opinion in regard to the program name that has changed many times since its first implementation? (Residential Energy Affordability Program, Low-Income Households Program, Low-Income Home Owners)**

**Q14- What is your opinion in regard to program on-course modifications other than the change of program name?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

**Q15- Did you receive any complaints from other program partners?**

☐ Yes: If yes, from which partners? (Please do not mention names, just the position of the partner.)

☐ No

☐ Don't know

**Q15a- What was the complaint about?**

**Q16 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

**Q17 – In your opinion, do you believe that participants still expect the program to replace their refrigerators and freezers?**

☐ Yes

☐ No

☐ Don't Know

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX VII - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Questionnaire**

#### **Low Income Homeowners**

October 26, 2011

I1. Hello may I please speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

[INTRODUCTION]

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your household recently participated in Efficiency Nova Scotia Corporation's Low Income Homeowners Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program.

The Low Income Homeowners program would have done an energy evaluation of your home and then installed or given you a variety of energy-saving measures such as light bulbs, appliances, insulation, or weather stripping. Do you recall participating in this program?

1. Yes [CONTINUE]

No, I don't remember the program / Don't know  
[PROMPT: "Are you sure? Someone would have come to your house and looked around for ways you could save energy and money?" RECODE AS "YES" IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS NO: Is there someone else in the household who would know about having participated in the Low Income Homeowners program? THANK AND TERMINATE.]

- a. Yes: [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]
- b. No [THANK & TERMINATE]
2. No, but they came to my previous home [CONTINUE]
99. Refused [THANK AND TERMINATE]

The survey will take about 10 minutes. Is this a good time for you?

[IF REFUSED, ASK "Can we schedule a more convenient time for you to conduct this survey?"]

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

**Section P- Program notoriety, Reasons for participating and Overall satisfaction with the program**

P1. How did you learn about the Low Income Homeowners program? [DO NOT READ. ACCEPT MULTIPLE RESPONSES]

1. (While applying for fuel assistance)
2. (Someone called me about the program)
3. (I received a letter about the program)
4. (Through Efficiency Nova Scotia's website)
5. (My neighbour, friend, co-worker, or family member told me about it)
6. (Newspaper)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

P2. Do you still live in the house that was part of the Low Income Homeowners Program?

1. Yes [GO TO P3]
2. No [CONTINUE] \_\_\_\_\_
98. (Don't Know) [ASK FOR THE PERSON WHO WOULD KNOW]
99. (Refused) [THANK AND TERMINATE]

[IF P2 = 2 (NO): Please answer the survey questions based on the house that went through the program.]

- P3. What was the SINGLE most important reason you chose to participate in the program?  
[ACCEPT ONE RESPONSE] [DO NOT READ]
1. (To save on energy costs/bills)
  2. (To receive a new refrigerator/freezer)
  3. (To receive a new dehumidifier)
  4. (My old refrigerator was not working well)
  5. (Comfort)
  6. (To receive free compact fluorescent bulbs)
  7. (To receive free power bars)
  8. (Improve resale value)
  9. (To help the environment)
  10. (Reduce greenhouse gases)
  11. (No cost for services/program was free)
  12. (To reduce my water consumption)
  96. (Other) [SPECIFY \_\_\_\_\_])
  98. (Don't know) [GO TO P5]
  99. (Refused) [GO TO P5]
- P4. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE. SAME LIST AS P3]
- P5. Before participating, did you have any concerns about taking part in the program?
1. Yes [ASK P6]
  2. No
  98. (Don't know)
  99. (Refused)
- P6. [IF P5 = 1] What were those concerns? [DO NOT READ. ACCEPT ALL RESPONSES]
1. (That I wouldn't be eligible)
  2. (That I'd have to pay something)
  3. (Didn't believe it was really free)
  4. (Wouldn't like what they gave me)
  5. (Concern that participation will affect eligibility for other assistance programs – social assistance, heating assistance rebate)
  96. (Other) [SPECIFY \_\_\_\_\_])
  98. (Don't know)
  99. (Refused)

P7. Thinking of your OVERALL experience with the Low Income Homeowners Program, including any services or energy efficient products received and installed, how satisfied were you overall with the program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

1. Very satisfied
2. Satisfied
3. Neither satisfied or dissatisfied
4. Dissatisfied
5. Very Dissatisfied
98. (Don't know)
99. (Refused)

P8. [IF DISSATISFIED—P7= 4 or 5] You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were dissatisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]

1. (The evaluation took too long)
2. (I expected more)
3. (I don't like the refrigerator I received)
4. (I don't like the freezer I received)
5. (I don't like the light bulbs I received)
6. (I don't like the light fixtures I received)
7. (I don't like the dehumidifier I received)
8. (I don't like the power bars I received)
9. (I don't like the envelope/insulation/wrap upgrade)
10. (I don't like the thermostats installed)
11. (I don't like the ventilation installed)
12. (I don't like the low flow showerhead installed)
13. (I don't like the low flow faucet aerators installed)
14. (I did not like the evaluator who visited the home)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know) [GO TO P10]
99. (Refused) [GO TO P10]

P9. [IF DISSATISFIED—P7= 4 or 5] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE— SAME LIST AS P8]

Now I am going to read a list of specific aspects of the Low Income Homeowners program. Using a scale from 1 to 5, where 1 means "very dissatisfied" and 5 means "very satisfied", please tell me how satisfied you are with your experience with each aspect of the program. DO NOT ROTATE - DO NOT ACCEPT A RANGE

|                                             | V.Dissat | Dissat | Neither | S | VS | DK/Ref |
|---------------------------------------------|----------|--------|---------|---|----|--------|
| P10. Overall communication from the program | 1        | 2      | 3       | 4 | 5  | 98/99  |
| P11. Energy Evaluation                      | 1        | 2      | 3       | 4 | 5  | 98/99  |

[PROMPT, IF NECESSARY: This is an inspection and analysis of your home's energy use that was performed by an energy professional.]

|                                                     |   |   |   |   |   |       |
|-----------------------------------------------------|---|---|---|---|---|-------|
| P12. Time Required to Complete Work                 | 1 | 2 | 3 | 4 | 5 | 98/99 |
| P13.a. Energy Evaluation Evaluator overall          | 1 | 2 | 3 | 4 | 5 | 98/99 |
| b. Courteousness of Energy Evaluator                | 1 | 2 | 3 | 4 | 5 | 98/99 |
| P14.a. Energy Efficiency Presentation               | 1 | 2 | 3 | 4 | 5 | 98/99 |
| b. Energy Evaluation Report with<br>Recommendations | 1 | 2 | 3 | 4 | 5 | 98/99 |
| c. Program contractor/worker                        | 1 | 2 | 3 | 4 | 5 | 98/99 |
| P15.a. Energy conservation measures installed       | 1 | 2 | 3 | 4 | 5 | 98/99 |
| b. Quality of the work completed                    | 1 | 2 | 3 | 4 | 5 | 98/99 |

P16. Has the information you received from the energy evaluation changed your behavior in terms of how you use energy at home?

1. Yes [ASK P17]
2. No
98. (Don't know)
99. (Refused)

P17. [IF P16=1] How has your behavior changed? [DO NOT READ. ACCEPT ALL RESPONSES]

1. (I turn off my lights now)
2. (I set my heating thermostat lower)
3. (I set my water heater thermostat lower)
4. (I hang my clothes to dry)
5. (I use less hot water to wash my clothes)
6. (I use fans instead of air conditioning)
7. (Close doors and windows)
8. (Turn off appliances)
96. (Other) [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

**Section VA - Verify actions removed**

VA2. Thinking of the energy efficiency measures installed through the Low Income Homeowners program, have you since that time removed any of these measures from your home?

1. Yes
2. No [SKIP TO SECTION SM]
98. (Don't know) [SKIP TO SECTION SM]
99. (Refused) [SKIP TO SECTION SM]

[IF YES TO VA2]

VA3. Which measures did you choose to remove from your home? [READ, RECORD ALL THAT APPLY]

**LIST OF MEASURES ON RECORD**

1. Air sealing or weather stripping
2. Programmable thermostats
3. Tank wrap for electric hot water heater
4. Pipe wrap for exposed hot water pipes
5. Low flow showerheads
6. Low flow faucet aerators
7. CFLs light bulbs (compact fluorescent light bulbs)
8. CFL torchiere lamp
9. CFL compatible fixtures that had replaced ceiling (flush mount) fixtures
10. CFLs that had replaced broken or un-covered outdoor porch light fixtures
11. Electric kettle with auto shut-off
12. Power bars
13. Dehumidifier
96. Other (specify: \_\_\_\_\_)
98. (Don't know)
99. (Refused)

RECORD ABOVE AS YES/NO/DON'T KNOW



VA4. FOR EACH MEASURE RESPONDENT CHOSE TO REMOVE (VA3): Why did you choose to remove the [READ EACH 'YES' RESPONSE FROM VA3]? [DO NOT READ]

1. (Did not work like I thought it would)
2. (Too complicated to use)
3. (Did not like the way it looked in my space)
4. (Worried that the light bulbs may cause health risks)
5. (Hassle factor, too much disruption to my daily routine)
6. (Did not believe any changes will result in lower energy bills)
7. (Did not trust in energy professionals installing new measures)
96. Other [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

### **Section SM - Satisfaction with the effects of the energy conservation measures on their energy bills**

SM1. Since the measures were installed through the program, what changes, if any, have you noticed in your energy bills? Have ... READ STATEMENTS IN ORDER - RECORD ONE RESPONSE

1. Your bills gone down
2. Your bills gone up, or
3. Has there been no change in your bills
- VOLUNTEERED
4. It is too soon to tell)
98. (Don't know)
99. (Refusal)

### **Section IM - Impact of measures**

IM1. Please indicate how each of the following has changed since participating in the Low Income Homeowners Program. On a scale of 1 to 5, where 1 means "no improvement" and 5 means a "considerable improvement") how much has \_\_\_\_\_ improved? ROTATE/RANDOMIZE - DO NOT ACCEPT A RANGE.

- a. The Comfort of the house \_\_\_\_\_
- b. The Value of the house \_\_\_\_\_
- c. The Reduction in energy bills \_\_\_\_\_
- d. Your Energy efficiency interest \_\_\_\_\_
- e. Your Energy efficiency knowledge \_\_\_\_\_

IM2. How have the energy savings measures installed by the program in your home impacted your COMFORT LEVEL? Have they: [RANDOMIZE, READ AND RECORD EACH]

1. Provided even temperatures throughout the home
2. Made it more convenient to control temperature automatically, day or night
3. Noticeably fewer drafts throughout home
4. Provided longer lasting hot water
5. Reduced the noise level of replaced appliances
6. Improved indoor and outdoor lighting
96. Other [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

### **Section VP- Value of the program to customers**

VP2. Would you recommend the Low Income Homeowners program to a family member or friend?

1. Yes
2. No
98. (Don't know)
99. (Refused)

VP3. [IF VP2 = 2 (NO)] Why not? [DO NOT READ – ACCEPT multiple responses]

1. (Is not worth the expenses)
2. (No family members or friends that could be eligible)
3. (Concern that actual bill savings would be less than estimated)
4. (Lack of information to make an informed decision)
5. (Incentive is too low)
6. (Energy efficient equipment does not meet payback requirements)
96. (Other [**Specify:** \_\_\_\_\_])
98. (Don't know/Don't recall)
99. (Refused)

---

**Section B - Barriers to action**

B1 Were there any energy efficiency measures recommended by the Low Income Homeowners program that you chose not to install or implement in your home?

1. Yes
2. No [SKIP TO R1]
98. (Don't know) [SKIP TO R1]
99. (Refused) [SKIP TO R1]

[IF YES TO B1]

B2. Which measures did you choose not to install or implement in your home? [READ – ACCEPT multiple responses]

REMOVE FROM LIST MEASURES THAT WERE INSTALLED THROUGH THE PROGRAM  
(CORRESPOND TO “1” IN THE DATABASE)

1. Building envelope measures such as: insulation, air sealing, weather stripping, or exterior door installation or replacement
2. Programmable thermostats
3. Tank wrap for electric hot water heater
4. Pipe wrap for exposed hot water pipes
5. Low flow showerheads
6. Low flow faucet aerators
7. CFLs light bulbs (compact fluorescent light bulbs)
8. CFL torchiere lamp
9. Replacement of ceiling (flush mount) fixtures with CFL compatible fixtures
10. Replacement of broken or un-covered outdoor porch light fixtures to accommodate CFLs
11. Primary refrigerator and/or stand-alone freezer replacement
12. Second refrigerator and/or freezer removal
13. Electric kettle with auto shut-off
14. Power bars
15. Dehumidifier
96. Other (specify : \_\_\_\_\_)
98. (Don't know)
99. (Refused)

- B3. FOR EACH MEASURE, RESPONDENT CHOSE NOT TO INSTALL (B2): Why did you choose not to install or implement this energy efficiency measure in your home? [DO NOT READ]
1. (No time to implement measure or practice)
  2. (Hassle factor, too much disruption to my daily routine)
  3. (Did not believe any changes would result in lower energy bills)
  4. (Did not trust in energy professionals installing new measures)
  96. Other [SPECIFY\_\_\_\_\_]
  98. (Don't know)
  99. (Refused)

## **Section R - Interest in other possible measures and recommendations**

- R1. Do you have any recommendations that you think would help improve the Low Income Homeowners program? Probe: Anything else?
1. (Offer more products/measures to be installed)
  2. (Offer more information on products/measures installed or recommended)
  3. (Facilitate participation process)
  4. (Make better promotion of the program or promote it in another way)
  5. (Complete work faster)
  6. (Improve quality of work)
  7. (Improve communication)
  8. (No recommendation)
  96. (Other) [Describe\_\_\_\_\_]
  98. (Don't know)
  99. (Refused)

- R2. Would a figure illustrating the various steps to follow in order to participate in the Low Income Homeowners Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?

IF RESPONDENT SEEMS TO NEED EXTRA EXPLANATION : By that, we are wondering if a document illustrating the step by step process of how to apply for and take part in the program would have assisted you during your participation in the program.

1. \_\_\_ Significantly
2. \_\_\_ Somewhat
3. \_\_\_ Slightly
4. \_\_\_ Not at all

- 96. (Depends on what the figure or illustration would have been)
- 97. (This kind of document already exists)
- 98. (Don't know)
- 99. (Refused)

## **Section D - Demographic characteristics**

[ASK ALL RESPONDENTS]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-5; SELECT ONE RESPONSE]

- 1. Detached single-family home
- 2. Semi-detached house
- 3. Mobile home or house trailer
- 4. Townhouse or duplex which share adjacent walls
- 5. Row house (Single story apartment building)
- 96. Other [SPECIFY: \_\_\_\_\_]
- 98. (Don't know)
- 99. (Refused)

D2. How many bedrooms are in your home? [98=DK; Enter zero for a studio apartment with no bedrooms]

D4. Do you pay the electric bills for your home?

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

D5. Is your home occupied year round, or is it a seasonal home?

- 1. Year round residence
- 2. Seasonal / vacation home
- 7. (Other Specify \_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]

D7. What is your age group? Are you...[READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation certificate)
2. (High school graduation certificate and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University certificate or diploma)
98. (Don't know)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
8. \$80,000 or more
98. (Don't know)
99. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK YOU FOR TAKING THE TIME TO RESPOND TO THIS SURVEY.]







# **PERFORMANCE PLUS PROGRAM IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**



Final Report



February 20, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Performance Plus program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and 10 builders, two on-site visits, and a telephone survey of 70 program participants.

## **PROGRAM OVERVIEW**

The Performance Plus program provides financial incentives to homeowners and builders in order to encourage them to include energy efficiency measures in new residential constructions with a view to exceeding the energy efficiency requirements set out in the building code.

The program includes a first review and analysis of house plans, using a simulation tool developed by the federal government, HOT2000. The simulation results are then provided to the builder or the homeowner through a report. This report includes the recommended energy efficiency measures as well as the estimated EnerGuide rating that will be achieved through the implementation of the suggested measures. The homeowner or the builder has up to 12 months to complete construction after registration in the program. A final inspection and a blower door test are completed once the home is built to assess the home's level of efficiency and to provide a final EnerGuide rating.

The following measures were promoted through the program:

- > ENERGY STAR®-qualified ductless ("mini split") air source heat pumps;
- > ENERGY STAR-qualified central ("ducted") air source heat pumps;
- > ENERGY STAR-qualified ground source heat pumps;
- > ENERGY STAR-qualified oil boilers or furnaces;
- > ENERGY STAR-qualified natural gas or propane boilers;
- > ENERGY STAR-qualified natural gas or propane furnaces;
- > central wood or pellet heating systems;
- > electric thermal storage systems;
- > programmable electronic thermostats;
- > drain water heat recovery equipment;
- > solar domestic water heating systems;
- > electric water heater pipe wraps;
- > electric water heater tank wraps; and
- > at least 10 energy-efficient light bulbs in fixtures.

In 2011, the program aimed to achieve net electricity savings of 2.60 GWh and demand savings of 0.79 MW.

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## **KEY FINDINGS**

The 2011 evaluation of the Performance Plus program demonstrated that the program is well designed. The program totalled 701 participants for the year 2011, which represents a significant increase compared to the previous year (260). In terms of net energy savings, the program generated 2.45 GWh in 2011, which represents an increase of approximately 360 percent in comparison to 2010 net savings (0.68 GWh).

### **Homeowner and Builder Involvement**

Most homeowner participants personally took part in the decision to participate in the Performance Plus program and in the decision to implement the energy efficiency measures. Moreover, in comparison with the 2010 evaluation, more homeowner participants became involved at an earlier stage in the decision process, meaning that they took part in the program at the initial stage.

However, this result does not take away from the importance of builders. This can be explained by the fact that a significant share of homeowner participants have mentioned that the decision to participate in the program was made by the builder. Moreover, home builders and contractors have been cited by surveyed participants as being an important source of program awareness. This goes to show the importance of those partners in the program. As a matter of fact, the participating builders contacted during the in-depth interviews were all very satisfied with the program, very content to be a part of it and wished for it to continue.

### **Satisfaction**

Satisfaction with the program is very high among homeowner participants. Indeed, nearly all surveyed participants (91%) expressed their satisfaction with the overall program. They were also highly satisfied with various aspects of the program, notably the final energy audit overall, which received the highest score (93%). Suggestions for improving the program from homeowner participants included offering more information on the measures recommended and increasing program advertising.

### **Program Energy Savings**

To calculate the net savings of the Performance Plus program in 2011, Econoler reviewed the gross savings estimated by Efficiency Nova Scotia Corporation (ENSC) using two features, namely the savings per EnerGuide point increase and the savings generated in relation with the implementation of a series of prescriptive measures. Energy savings realized as a function of EnerGuide point increases are calculated through the comparison of the participant house final EnerGuide rating and an average baseline EnerGuide rating considered representative of houses being built to code in 2011.

In the 2011 program evaluation, Econoler took into account the studies conducted for validating the average baseline EnerGuide rating and adjusted the baseline used by ENSC from 80 to 78. In addition, Econoler performed several simulation calibration analyses for fine-tuning the value of savings per EnerGuide point. This value has hence been adjusted from 1,032 kWh to 817 kWh saved per EnerGuide point. Through the gross savings evaluation, Econoler finally modified a number of energy savings per prescriptive measure used by ENSC, on the basis of national demand-side management (DSM) studies carried out in 2010 and 2011.

In its net savings calculations, Econoler took into consideration the free-ridership and internal spillover levels measured through the participant survey, as well as the market effects obtained through the builder in-depth interviews. Through this analysis, Econoler found that the 2011 free-ridership level calculated among builders (23%) was significantly lower than that featured in the 2010 evaluation (79%). Similarly, the level of free-ridership among homeowners decreased between the two evaluations, from 52 percent in 2010 to 37 percent in 2011. This difference could be partially due to the enhancements made to the approach for evaluating free-ridership. Econoler did not find significant spillover effects for this program in 2011. With regard to the market effects, Econoler evaluated them at 5 percent for this program.

The next table presents the key distortion effects calculated through the program impact evaluation.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

| <b>Distortion Effects</b> | <b>2011 Values</b> |
|---------------------------|--------------------|
| Free-Ridership Level      | 32%                |
| Spillover Level           | 0%                 |
| Market Effects            | 5%                 |
| Net-to-Gross Ratio        | 0.73               |

The evaluation revealed that the Performance Plus program had generated net energy savings of 2.454 GWh and demand savings of 0.861 MW in 2011, as shown in the next table.

**Table 2: 2011 Program Net Savings at the Generator**

|                           | Initial Gross Savings | Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|----------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 2.948 GWh             | 2.948 GWh                              | 0.46        | 1.356 GWh        |
| <b>Evaluation Results</b> | <b>3.791 GWh</b>      | <b>3.361 GWh</b>                       | <b>0.73</b> | <b>2.454 GWh</b> |
| <b>Demand Savings</b>     |                       |                                        |             |                  |
| Tracked Savings from ENSC | 1.560 MW              | 1.560 MW                               | 0.46        | 0.717 MW         |
| <b>Evaluation Results</b> | <b>1.324 MW</b>       | <b>1.180 MW</b>                        | <b>0.73</b> | <b>0.861 MW</b>  |

As per the last table, the evaluated net energy savings exceeded those tracked by ENSC by more than 80 percent. This is mainly due to the adjustment of the house rating baseline value used for calculating the savings per EnerGuide point, from 80 to 78. In addition, the net-to-gross ratio (NTGR) calculated for 2011 (0.73) is higher than the one calculated as part of the 2010 program evaluation (0.46). Despite the fact that ENSC and Econoler used the same energy-to-demand ratio, the realization rate for net demand savings only amounts to 120 percent as opposed to the 180 percent figure attributed to energy savings. The reason for this is that Econoler adjusted significantly the unitary peak demand savings related to the installation of electric thermal storage systems (reduction of tracked demand savings by approximately 75% for this system).

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 DSM programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- PP-R1. Increase the number of in-depth interviews with home builders:** When conducting in-depth interviews with builders, the Evaluator noted that one participating builder mentioned having built houses that would have reached an EnerGuide rating of 83, but without participating in the program. One non-participating builder also mentioned having implemented energy efficiency measures that were promoted by the program. However, the low sample of interviewed builders (10) prevented the Evaluator from clearly determining whether this finding would translate into more substantial market effects than those calculated in relation with the builder interview results. Consequently, Econoler recommends increasing the number of interviews with participating builders in future evaluations to have a better chance of capturing potentially more significant market effects.



- PP-R2. Improve program communication:** The main recommendations expressed by homeowner participants were related to communication improvements. More specifically, the surveyed participants suggested improving the program by offering more information on the measures recommended and increasing program advertising. Moreover, the fact that some respondents stated that ENSC should add measures to the program that were already covered by the latter, shows that improving program communication is necessary.
- PP-R3. Include the building energy consumption data of HOT2000 simulations in the tracking sheet:** The Evaluator recommends calculating the energy savings of each participant through the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the project savings. Then, this savings figure may have to be adjusted with the calibration of the HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.
- PP-R4. Revise HOT2000 models on a random basis:** The Evaluator or the PM should review a small percentage of HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should correspond at least to one project per energy advisor.
- PP-R5. Add a percentage of heating delivered by electricity:** For the year 2011, ENSC claimed 100 percent of EnerGuide point increase savings for houses whose main heating source was electricity even if there was a non-electric backup heating system installed. This assumption increases the uncertainty in gross impact calculations. Econoler believes that ENSC's tracking sheet should include a percentage (ranging from 0 to 100%) to take into account houses that are not fully heated with electricity year-round. This information can be collected from HOT2000 simulation results. The program delivery agents should also be able to verify this information on site during their audit with program participants.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION**

Efficiency Nova Scotia Corporation's (ENSC) Performance Plus program is aimed at encouraging homeowners and builders across Nova Scotia (NS) to exceed the required building code for energy efficiency in new homes. The intended result is to build energy-efficient homes.

The program is funded through electricity ratepayers and the Province of Nova Scotia. The funds received from electricity ratepayers go towards measures that reduce electricity consumption, whereas funds from the Province of Nova Scotia are directed to all homes regardless of their heating type.

Three delivery agents (DAs), approved by Natural Resources Canada (NRCan), operate across Nova Scotia under the Performance Plus program. To participate in the program, the homeowner or the builder must first register the house within 30 days of obtaining the building permit. A payment of \$250 is necessary at this stage. Once the house is registered, the building plans are analyzed using a simulation tool developed by the federal government, HOT2000<sup>1</sup>. The simulation results are then provided to the builder or the homeowner through a report. This report includes the recommended energy efficiency measures as well as the estimated EnerGuide rating that will be achieved through the implementation of the suggested measures. In Nova Scotia, the building code requires new homes to include minimum energy efficiency standards of the equivalent of a minimum EnerGuide rating<sup>2</sup> of 80; this is achieved by following prescriptive standards or by having an EnerGuide test completed. In order to be eligible for the Performance Plus program and its rebates, builders and homeowners must reach an EnerGuide rating equivalent to 83 or higher. The homeowner or the builder has up to 12 months to complete construction after registration in the program. A final inspection and a blower door test are completed once the home is built to assess the home's level of efficiency and to provide a final EnerGuide rating.

Based on the EnerGuide rating provided during the final evaluation of the house, incentives are available to either the homeowner or to the builder. Rebates are paid to the homeowner or occupant of the house unless the homeowner and builder decide to transfer the rebates directly to the builder, which would reduce the final costs of the construction initiated by the builder. In this particular case, the homeowner needs to complete and sign a form to confirm consent to provide the rebate directly to the home builder.

---

<sup>1</sup> HOT2000 is a residential energy analysis software approved by Natural Resources Canada (NRCan) for calculating EnerGuide ratings. This software was developed by the Housing, Buildings, Communities and Simulation (HBCS) group of CanmetENERGY, a division of NRCan. For additional information: [http://198.103.48.154/eng/software\\_tools/hot2000.html](http://198.103.48.154/eng/software_tools/hot2000.html).

<sup>2</sup> As of January 2012, studies had been made to determine the minimum EnerGuide rating value that would be most likely representative of the building practices that were in compliance with the Building Code of Nova Scotia. More information on this matter is provided in Section 4.2.1.

Several types of incentives are provided through the program. As mentioned above, the builder or the homeowner needs to send a payment of \$250 to have the initial evaluation of the house plans conducted. ENSC pays an additional \$250 necessary to perform the audit. Other incentives are also offered based on the final EnerGuide rating, the type of space or water heating system and the lighting equipment installed.

The following measures were covered through the program:

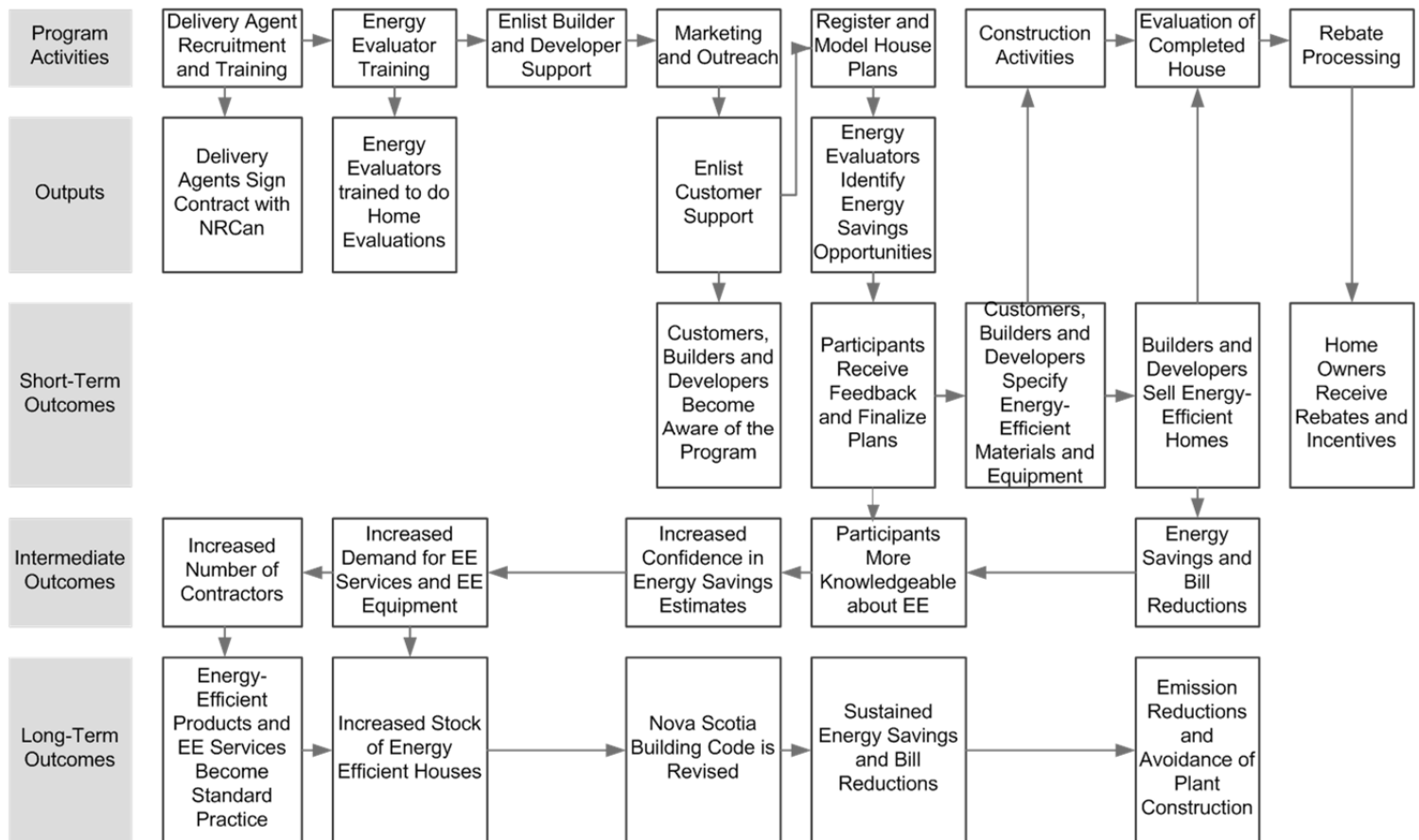
- > ENERGY STAR-qualified ductless (“mini split”) air source heat pumps;
- > ENERGY STAR-qualified central (“ducted”) air source heat pumps;
- > ENERGY STAR-qualified ground source heat pumps;
- > ENERGY STAR-qualified oil boilers or furnaces;
- > ENERGY STAR-qualified natural gas or propane boilers;
- > ENERGY STAR-qualified natural gas or propane furnaces;
- > central wood or pellet heating systems;
- > electric thermal storage systems;
- > programmable electronic thermostats;
- > drain water heat recovery equipment;
- > solar domestic water heating systems;
- > electric water heater pipe wraps;
- > electric water heater tank wraps; and
- > at least 10 energy-efficient light bulbs in fixtures.

In 2011, the program totalled 701 participants. For this year, the program aimed to achieve net electricity savings of 2.60 GWh and demand savings of 0.79 MW. For reference purposes, the Performance Plus program generated net energy savings of 0.68 GWh in 2010.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Performance Plus Program Logic Model**

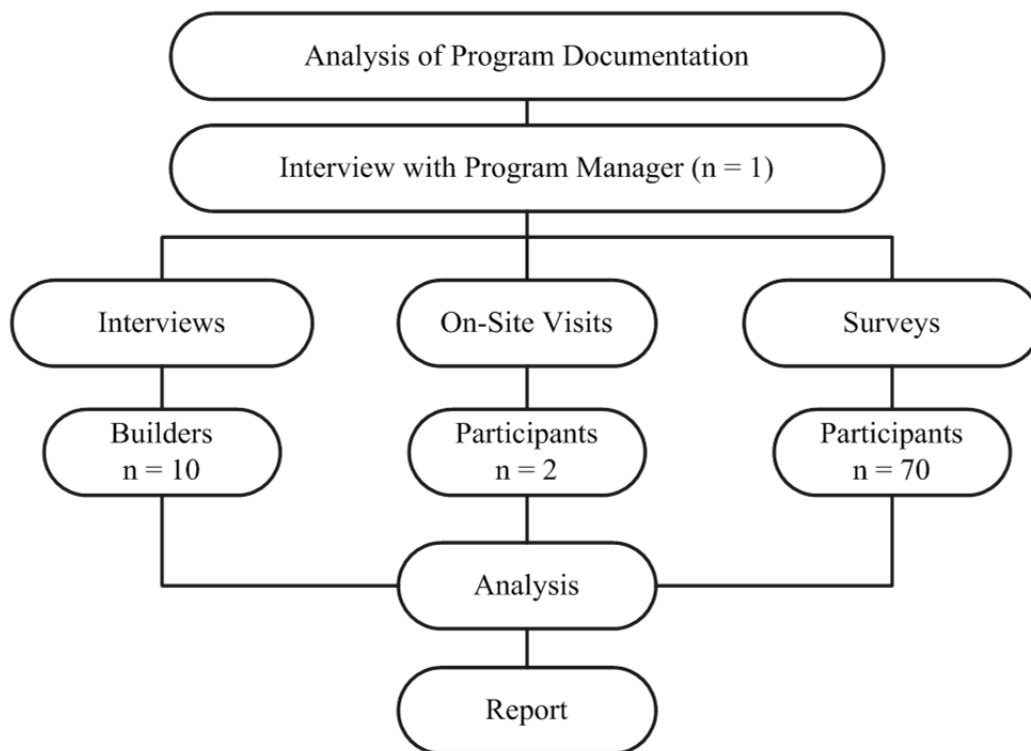


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

The figure below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guide and the survey questionnaire are included in Appendices III, IV and V.

**Figure 2: Methodological Model**



## 2.2 METHODOLOGY DESCRIPTION

### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the Performance Plus program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was obtained primarily from the following sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

For reference purposes, the protocol used by the Evaluator during the in-depth interviews with PMs is presented in Appendix III.

### **2.2.3 In-Depth Interviews with Program Partners**

#### **Interviews with Builders**

In November, 10 in-depth interviews were conducted with builders. The latter were required to have acted as registrants for the program during the year 2011 in order to be selected for these interviews. Interviews with eight participant builders were conducted to calculate the level of free-ridership and possible market effects. Interviews with two non-participant builders were conducted mainly to capture market effects, meaning that the Evaluator wished to determine whether these builders would have implemented high-efficiency measures under the influence of the program but without participating.

For reference purposes, the protocol used by the Evaluator during the in-depth interviews with builders is presented in Appendix IV.

#### **2.2.4 On-Site Visits**

In October, two on-site visits were conducted at new houses in which measures from the Performance Plus program had been implemented. The visits were conducted by Econoler's subcontractor, Philippe St-Germain, who is a certified ecoEnergy advisor. The sampling was established to include one house that was built by a contractor who had already participated in the Performance Plus program and one house that was built by the owner who had already built at least one house through the Performance Plus program. In both cases, the participants were knowledgeable about the program protocol. These site visits were used to validate that program auditors were following the EnerGuide guidelines and that all pertinent information for running the house simulation with HOT2000 was collected.

The methodology used for the on-site visits under the Performance Plus program is further explained in the program impact evaluation section of this report.

#### **2.2.5 Participant Survey**

A telephone survey with a total of 70 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 14 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > how participants learned about the program;
- > involvement of participants in the building decisions;
- > participant motivations, concerns and barriers;
- > satisfaction with the program;
- > spillover and free-ridership; and
- > impact of program measures.

The demographic profile of survey respondents is shown in Appendix II. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2009, 2010 and 2011 telephone surveys. For reference purposes, the protocol used for the participant survey is presented in Appendix V.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population       | Sample Size (n) | Sampling Error at 90% Confidence Level |
|-------------------|------------------|-----------------|----------------------------------------|
| 2009 Participants | 80               | 23              | ±14.6%                                 |
| 2010 Participants | 260              | 47              | ±10.9%                                 |
| 2011 Participants | 701 <sup>3</sup> | 70              | ±9.3%                                  |

---

<sup>3</sup> The program population for the 2011 survey was 195 participants at the time of establishing the sample for the survey.



### **3 PROCESS EVALUATION**

#### **3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION**

As no significant changes had occurred since the last process evaluation conducted in 2010, the Performance Plus program did not require a complete process evaluation for the year 2011. However, a participant survey was conducted as part of the data gathering activities contemplated for the evaluation. In addition to the questions designed for impact evaluation purposes (free-ridership and spillover), questions linked to program awareness, barriers, impact and overall satisfaction were asked to survey participants<sup>4</sup>. The following sections detail the results of such questions, the analysis of the program tracking sheet and the results of on-site visits with participants.

#### **3.2 PROGRAM TRACKING SHEET**

Econoler has reviewed the content of the tracking sheet for the Performance Plus program for new homes. This tracking sheet is an Excel spreadsheet used by the PM for program monitoring purposes.<sup>5</sup> In general, this tracking sheet is useful because it contains most information necessary for the PM to continuously monitor program savings. The necessary fields for program administration and evaluation purposes are present, but some improvements could make this tool a better asset for the PM and the Evaluator.

The tracking sheet is presented in one sheet with a unique file number for each participant. The complexity of the Performance Plus program monitoring lies in the fact that, for 2011, it includes several programs: Performance Plus, EnerGuide for New Houses and R2000. Still, the database is well conceived to track the project and the related rebate. Further, the customer information essential for conducting surveys was present in the tracking sheet.

All data necessary to calculate the estimated gross savings are included in the tracking sheet:

- > EnerGuide Rating data come from the HOT2000 simulations developed by the Service Organization.
- > Evaluated EnerGuide point savings value: 1,032 kWh. This value comes from the 2010 program evaluation report.

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<sup>4</sup> Survey results from 2009, 2010 and 2011 are presented when possible. Of note, 2009 results are presented as frequencies (#) since the number of respondents is very low, whereas most 2010 and 2011 results are presented as percentages (%).

<sup>5</sup> As part of this program process analysis, the Evaluator did not review the Performance Plus program data included in ENSC's online tracking sheet, namely the Demand Side Management Data System (DSMDS). At the time of writing this report, ENSC was working on the DSMDS to make it more accessible and ensure that the information contained was up to date.

- > Percentage of electric heat defined by the auditor and used in the HOT2000 simulations.
- > Individual measures, also known as prescriptive measures. For each measure, the quantity of equipment, the associated rebate and energy savings are presented. The energy savings data come from last year's evaluation.

The energy savings (in kWh) and electrical demand savings (in kW) for each project are presented in different columns. While the tracking sheet is efficient, a number of adjustments could be made in the future to improve its consistency for program evaluation. The Evaluator recommends that ENSC:

- > **Determine the required fields and remove those that are unnecessary:** The PM, together with the Evaluator, should determine what fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. Conversely, the fields that are not utilized should be removed from the tracking sheet in order to concentrate the efforts on the essential.
- > **Delete fields for individual measures savings for which energy savings are included in the EnerGuide rating:** Currently, each measure has an associated field indicating the related annual energy savings. These savings were shown for reference purposes and were not used by ENSC for overall program savings calculations. After analyzing simulations under HOT2000, only four of these measures were found not to affect the computed EnerGuide ratings. As a result, the energy savings associated with the measures have to be added in separate columns. These measures are as follows: programmable electronic thermostats, electric water heater pipe wraps, drain water heat recovery (DWHR) with an efficiency below 42 percent and DWHR with an efficiency above 42 percent. The Evaluator suggests removing the fields that are not necessary to calculate the energy savings including the "estimated kWh savings for individual measures" column to facilitate understanding of the tracking sheet.
- > **Differentiate the applicant:** The building owner, the occupant or the builder can apply for the Performance Plus program. For tracking purposes, the Evaluator suggests creating separate fields for each.
- > **Create fields for building energy consumption data:** Currently, energy savings are calculated using the EnerGuide rating. It may be suitable and more accurate to calculate them with the energy consumption data from HOT2000. Econoler recommends adding fields for building energy consumption per year in kWh for both a baseline house built to code and the house as completed.
- > **Ensure that all fields are systematically filled in:** Once the necessary fields are identified, it is recommended that they be systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet.

### 3.3 ON-SITE VISITS

The on-site visits conducted as part of the evaluation of the Performance Plus program were used to assess the procedure and the ecoEnergy protocol that the energy advisors must follow during the audits. The ecoEnergy protocol was established by Natural Resources Canada (NRCan) to provide a framework for energy auditors. The new house audits must be conducted by a certified ecoEnergy advisor who answers any questions about energy use in the home, verifies the proper implementation of energy efficiency measures and collects relevant documentation on house design (if available). Each parameter used in the HOT2000 models must be validated and documented appropriately. Furthermore, the audit procedures should be clearly explained to participants.

During the two visits, the Evaluator noted that the advisors were following EcoEnergy protocol procedures well. Key data were collected and pertinent information was delivered to participants. Nevertheless, the Evaluator identified a number of opportunities for improving the on-site visit effectiveness of the advisor.

The main issue identified by the Evaluator is related to the approach used for performing the blower door tests. It is important to follow the protocol down to the last detail in order to ensure that the data collected are accurate and consistent for all audited buildings. During the two site visits, the blower door opening (fan hole) was left opened during the initial depressurization test, which assesses pressure differences caused by wind fluctuations. Moreover, internal and external temperatures were not taken systematically when conducting the blower door tests. In some cases, the temperature was taken a few hours before the test, on a different site. These two practices (keeping the fan hole opened during the initial test and not taking the temperature on site at the time of testing) may lead to biased test results. Nevertheless, overall, the blower door tests were performed properly. Indeed, both advisors made sure that the air exchanger units' openings were fully closed during the test. As defined by the protocol, sinks, floor drains and siphons were also properly filled with water.

Taking into account the findings of the two on-site visits, the Evaluator recommends to:

- > **Explain in detail the protocol to the clients:** The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations, etc.). Participants may have difficulties understanding a number of these concepts.
- > **Document house parameters:** The architectural elements of the houses (building faces, foundation and roof) should be photographed in order to keep a record and create more precise HOT2000 models. This is especially true when the simulations are made at a certain time upon completion of the site visit. This practice also allows for the verification of the simulation data entries by a third party that has not been on site.

- > **Enforce the protocol procedures for performing blower door tests:** In light of the on-site visits conducted, the Evaluator identified two relevant mistakes in conducting the blower door tests, namely advisors did not block the blower door opening during the initial test and failed to take the temperature on site during the visit. These practices may influence significantly the HOT2000 simulation and thereby the calculated EnerGuide rating.
- > **Encourage the energy advisor to provide participants with booklets:** Under its ecoENERGY program, NRCan developed a series of booklets for home owners aiming to explain energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide “Keeping the Heat In”). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants agreeing with the recommendations of the audit report.

## 3.4 PARTICIPANT PERSPECTIVES

### 3.4.1 Program Awareness

Performance Plus program participants found out about the program in a number of different ways. Three in 10 heard about the program from a contractor (29%), while just under two in 10 heard about it from a builder (17%) or read about it on the Internet (17%). One in 10 report hearing about the program from word of mouth (11%). These results show significant differences compared to last year's findings. Indeed, in 2010, the main sources of awareness were builders, publications (newspapers or renovation guides) and home shows.

**Table 4: Program Awareness**

| <b>Source of Awareness*</b>                                       | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|-------------------------------------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample Size</i>                                                | <i>10</i>       | <i>43</i>       | <i>70</i>       |
| From a contractor                                                 | --              | 2%              | 29%             |
| Builder                                                           | 2               | 28              | 17              |
| Internet (unspecified)                                            | --              | 7               | 17              |
| Word of mouth (neighbour, friend, co-worker, family member, etc.) | 3               | 9               | 11              |
| Radio advertisement                                               | --              | 5               | 7               |
| Real estate agent                                                 | --              | 2               | 6               |
| Newspaper/renovation guide ad or story                            | 1               | 21              | 4               |
| Home show (unspecified)                                           | --              | 16              | 4               |
| NSHBA member list                                                 | --              | --              | 1               |
| Call to NS Power                                                  | --              | 5               | --              |
| Did own research                                                  | --              | 5               | --              |
| Nova Scotia Power website                                         | 1               | --              | --              |
| Nova Scotia Power bill insert                                     | --              | 2               | --              |
| In electrical business                                            | --              | 2               | --              |
| R-2000 Manager                                                    | 1               | --              | --              |
| Nova Scotia/ideal new home show                                   | 1               | --              | --              |
| Letter (unspecified source)                                       | 1               | --              | --              |
| Nova Scotia government website                                    | 1               | --              | --              |
| Conserve Nova Scotia website                                      | 1               | --              | --              |
| Previous experience building with EnerGuide                       | 1               | --              | 1               |
| Other (unspecified)                                               | --              | --              | 16              |
| Don't know/refused                                                | 1               | 5               | 1               |
| *Multiple responses                                               |                 |                 |                 |

### 3.4.2 Homeowner Involvement in Decision Making

The majority of respondents personally took part in the decision to participate in the program (76%) or took part in the decisions regarding the energy efficiency measures to implement through the program (74%). Those results show a high level of involvement on the part of homeowners, although a non-negligible proportion of builders are involved in decision making showing the importance of builders as program partners.

**Table 5: Homeowner Involvement in Decision Making**

| <b>Owner Involved in Decision to Participate in the Program</b>               | <b>2011</b> |
|-------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                            | <i>70</i>   |
| Yes                                                                           | 76%         |
| No/the builder made the decision                                              | 23          |
| Don't know                                                                    | 1           |
| <b>Owner Involved in Decision to Implement the Energy Efficiency Measures</b> | <b>2011</b> |
| <i>Sample Size</i>                                                            | <i>70</i>   |
| Yes                                                                           | 74%         |
| No/the builder made the decision                                              | 16          |
| Don't know                                                                    | 10          |

The majority of participants (77%) were involved in the initial planning and design stage, which marks an increase compared with previous findings, while just over one in 10 were not involved or bought their home after it was completed (13%).

**Table 6: Stage of Owner Involvement in Home Energy Efficiency Decision**

| <b>When Owner Became Involved</b>                         | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|-----------------------------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample Size</i>                                        | <i>10</i>       | <i>43</i>       | <i>70</i>       |
| Initial planning/design stage                             | 5               | 53%             | 77%             |
| Not involved/bought home after project completion         | 3               | 23              | 13              |
| After plan finalization, before measure implementation    | --              | 14              | 6               |
| After measure implementation, before final review of home | 2               | 7               | 4               |
| Don't know                                                | --              | 2               | --              |

### 3.4.3 Participation Motivations and Barriers

Having a house that would save on energy costs is one of the main motivations for participating in the program, with over two in 10 respondents mentioning this reason (23%) while under two in 10 indicated that their most important motivation was to get rebates in general (19%) and to get rebates for measures that had already been implemented in the house they bought (17%). Meanwhile, one in 10 was interested in having a more energy-efficient home (11%). Secondary motivations are similar to most important motivations.

Program marketing should continue to emphasize the energy bill savings and rebates offered through the program since they are the main motives for participation.

**Table 7: Reasons for Participating**

| Most Important Motivation                                                                 | 2010                      |                                   | 2011                      |                                   |
|-------------------------------------------------------------------------------------------|---------------------------|-----------------------------------|---------------------------|-----------------------------------|
|                                                                                           | Most Important Motivation | Second Most Important Motivation* | Most Important Motivation | Second Most Important Motivation* |
| <i>Sample Size</i>                                                                        | 21                        | 21                                | 53                        | 52                                |
| To have a house that would save on energy costs/bills                                     | 57%                       | 10%                               | 23%                       | 19%                               |
| To get rebates (general)                                                                  | --                        | --                                | 19                        | 15                                |
| To get rebates for measures that had already been implemented in the house I bought       | 10                        | --                                | 17                        | 10                                |
| Interested in having a better, more energy-efficient home                                 | 5                         | 10                                | 11                        | 8                                 |
| Was thinking of implementing energy efficiency measures to my house anyway                | 10                        | 5                                 | 6                         | 4                                 |
| Energy efficiency (general)                                                               | --                        | --                                | 6                         | 2                                 |
| To find out how energy efficient the new house would be/to have the house evaluated       | 5                         | --                                | 6                         | --                                |
| Help the environment                                                                      | 5                         | 14                                | 4                         | 4                                 |
| To help save energy (not specified whether for cost, environment)                         | 5                         | 19                                | 4                         | --                                |
| I was generally interested in energy efficiency and renewable energy                      | --                        | 5                                 | --                        | 4                                 |
| To get expert advice on what measures to implement/how to make home more energy efficient | --                        | --                                | --                        | 2                                 |
| Had previously worked with other energy efficiency programs                               | 5                         | --                                | --                        | --                                |
| Comfort in home                                                                           | --                        | 10                                | --                        | --                                |
| No other reasons                                                                          | --                        | 29                                | --                        | --                                |
| Other                                                                                     | --                        | 10                                | 4                         | 10                                |
| Don't know                                                                                | --                        | 5                                 | 2                         | 31                                |
| *Multiple responses                                                                       |                           |                                   |                           |                                   |

Very few participants reported concerns with the program prior to taking part. Just six percent, or three participants, reported concerns. From those respondents, one was not sure about the eligibility of his modular home, one was not familiar with the type of measures implemented and one thought the process would take too long or be too complicated.

**Table 8: Concerns with Program Prior to Taking Part**

| <b>Concerns with Program Prior to Taking Part</b> | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|---------------------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample Size</i>                                | 2               | 21              | 53              |
| Yes                                               | --              | 5%              | 6%              |
| No                                                | 2               | 95              | 94              |
| Don't know                                        | --              | --              | --              |

### 3.4.4 Program Influence

Respondents were asked to rate the importance of different factors in their decision to buy or build a house with a high level of energy efficiency. Results indicate that the program incentive was the most influential factor in the decision (mean of 7.7 where 0 is “not at all important” and 10 is “extremely important”). The information or advice provided through the program was also important (7.3), followed by the EnerGuide Label and designation (6.8) and the feedback received from the review of home plans (6.5). Previous experience was less important to participants (3.7).

**Table 9: Importance of Program in Influencing Decision**

| <b>Importance of Program in Influencing Decision to Build or Buy a House with a High Level of Energy Efficiency</b>                 | <b>2011</b> |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                                                                  | 57          |
| Mean (0=Not at all important, 10=Extremely important):                                                                              |             |
| Program incentive                                                                                                                   | 7.7         |
| Information or advice provided through the program                                                                                  | 7.3         |
| The EnerGuide label and designation themselves                                                                                      | 6.8         |
| Feedback received from the review of home plans                                                                                     | 6.5         |
| Previous experience with the Performance Plus program, or a similar program from either Efficiency Nova Scotia or Nova Scotia Power | 3.7         |



### 3.4.5 Impact of Measures

Nearly all respondents (96%) reported that the energy efficiency measures resulted in a more comfortable home while eight in 10 (80%) noted that these measures resulted in significantly lower energy bills. This represents an increase when compared with 2010 findings.

**Table 10: Impact of Measures on Comfort Level and Energy Bills**

| <b>Measures Increased Home Comfort</b> | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|----------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample Size</i>                     | <i>10</i>       | <i>43</i>       | <i>70</i>       |
| Yes                                    | 10              | 91%             | 96%             |
| No                                     | --              | 7               | 1               |
| Don't Know                             | --              | 2               | 3               |
| <b>Measures Lowered Energy Bills</b>   | <b>2009</b>     | <b>2010</b>     | <b>2011</b>     |
| <i>Sample Size</i>                     | <i>10</i>       | <i>43</i>       | <i>70</i>       |
| Yes                                    | 7               | 65%             | 80%             |
| No                                     | --              | 7               | 4               |
| Don't know / refused                   | 3               | 28              | 16              |

### 3.4.6 Satisfaction with Program

There is a high level of satisfaction with the program, with nearly all respondents rating their overall experience as very satisfied or satisfied (91%). Respondents were highly satisfied with the final energy audit overall (93% offering a rating of 5 or 4, where 5 is "very satisfied") as well as with the first review of the house plans (89%) and with the scheduling and timing of the final audit (88%). The scheduling and timing of the review (85%) and the report received on the house plans' current energy efficiency (84%) also received high satisfaction ratings. Finally the overall rebates (81%) as well as the recommendations for energy efficiency measures (81%) received somewhat lower satisfaction ratings in comparison with other aspects, although ratings were still positive.

Among the small number of respondents who were dissatisfied with the program overall (three respondents), one reported that the rebates were too small.

Among the small number who were dissatisfied with their final energy audit (three respondents), one felt that the final energy audit took too long.

**Table 11: Satisfaction with Aspects of Program**

| Satisfaction with Program                             | 2009 (#) | 2010 (%) | 2011 (%) |
|-------------------------------------------------------|----------|----------|----------|
| <i>Sample Size**</i>                                  | 10       | 43       | 70       |
| Program overall                                       | 10       | 95%      | 91%      |
| <i>Sample Size</i>                                    | 5        | 21       | 54       |
| First review of house plans, overall                  | 3        | 86%      | 89%      |
| Scheduling and timing of review                       | 4        | 76       | 85       |
| Report received about house plan's current efficiency | 2        | 76       | 84       |
| <i>Sample Size</i>                                    | 5        | 28       | 58       |
| Final energy audit, overall                           | 3        | 86%      | 93%      |
| Scheduling and timing of final audit                  | 3        | 82       | 88       |
| Overall rebates provided by program                   | 3        | 82       | 81       |
| Recommendations for energy efficiency measures        | 2        | 79       | 81       |
| ** Don't know/no answer removed from calculations     |          |          |          |

The participating builders contacted during the in-depth interviews were all very satisfied with the program. They believed that it had not only been beneficial for the construction business but also that it had had a positive influence on homeowners and on their energy efficiency behaviors. The participating builders were delighted to be part of the program and wished for it to continue.

### 3.4.7 Participant Recommendations for Improvements

The majority (67%) of respondents did not offer any recommendations to improve the program. However, participants' main suggestions were related to communication improvements. Indeed, seven percent mentioned, respectively, offering more information on the measures recommended and advertising the program in a better way.

For instance, one respondent explained the lack of information in these terms: "I had no idea how much the rebate was going to be until I got the cheque. I had no idea what the price was at the end. I had no idea what the investment in the review was going to pay off. It would have been nice to know how much money was going to be available and when it was going to be available." Another respondent suggested informing customers about the program through documentation delivered with the building permit.

On the other hand, participating builders contacted during the in-depth interviews believed that improvements could be made on the first review of house plans and recommended that the results from this review be delivered faster.

**Table 12: Suggested Improvements to the Program**

| <b>Suggestions</b>                                                         | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|----------------------------------------------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample size</i>                                                         | <i>10</i>       | <i>43</i>       | <i>70</i>       |
| More marketing/advertising                                                 | 1%              | 7%              | 7%              |
| Offer more information on the measures recommended                         | --              | --              | 7               |
| Make process simpler (consolidate rebate programs)/clarify report          | 3               | 7               | 2               |
| Offer more measures eligible for rebates                                   | --              | --              | 1               |
| Improve the quality of work of the auditor                                 | --              | --              | 1               |
| Explain why people qualify and give opportunity to correct the application | --              | --              | 1               |
| The transition from NSPI to ENSC caused confusion                          | --              | --              | 1               |
| Faster certification process                                               | --              | 5               | 1               |
| Higher or more accurate efficiency ratings                                 | --              | 5               | --              |
| Focus more on new houses                                                   | --              | 5               | --              |
| More information regarding solar power                                     | --              | 2               | --              |
| Video on website showing efficient versus inefficient home                 | --              | 2               | --              |
| More knowledgeable people answering the phone                              | --              | 2               | --              |
| More communication with builder                                            | --              | 2               | --              |
| Continue program                                                           | --              | 2               | --              |
| Other                                                                      | --              | --              | 8               |
| No recommendation                                                          | --              | --              | 67              |
| Don't know                                                                 | --              | --              | 4               |

Two in 10 respondents (19%) indicated that some energy efficiency measures that were not covered by the program should have been, which is similar to findings from 2010. From these 13 participants, seven indicated that they would have liked to have heat pump measures covered, two mentioned renewable energy sources (solar panel and wind turbine), one mentioned insulation and another suggested geothermal heating. Those results indicate that program communication could be improved since most of these measures were already covered by the program. However, it is to be noted that some of the respondents who mentioned heat pumps were referring to the eligibility of some models. For example, one respondent said that he would have chosen a different heat pump than the one in compliance with the program.

**Table 13: Additional Energy Efficiency Measures Covered by the Program**

| <b>Additional Energy Efficiency Measures</b> | <b>2009 (#)</b> | <b>2010 (%)</b> | <b>2011 (%)</b> |
|----------------------------------------------|-----------------|-----------------|-----------------|
| <i>Sample Size</i>                           | 10              | 43              | 70              |
| Yes                                          | 1               | 23%             | 19%             |
| No                                           | 9               | 65              | 71              |
| Don't know                                   | --              | 12              | 10              |

There is agreement that a diagram illustrating the various steps to follow in order to participate in the Performance Plus program would have facilitated participation in the program. Specifically, six in 10 respondents believe that a diagram would have significantly or somewhat facilitated participation (61%). This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 14: Provision of a Diagram Illustrating Steps of the Performance Plus Program**

| <b>Diagram Illustrating Steps of Performance Plus Program would have Facilitated Participation</b> | <b>2011</b> |
|----------------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                                 | 70          |
| Significantly                                                                                      | 27%         |
| Somewhat                                                                                           | 34          |
| Slightly                                                                                           | 13          |
| Not at all                                                                                         | 14          |
| Don't know                                                                                         | 11          |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, Econoler analyzed the following parameters:

- > outcomes from HOT2000 simulations performed under the EnerGuide for Existing Houses (EEH) program (see below);
- > baseline new home rating study;
- > prescriptive measure savings;
- > free-ridership;
- > internal spillover; and
- > market effects.

The initial methodology included the review of 23 HOT2000 simulations to determine specific savings per point for the Performance Plus program. Unfortunately, complications occurred with NRCan and ENSC could not get the simulation files this year. ENSC is working to develop a memorandum of agreement with NRCan for 2012 and will revise its waivers with participants to enable access to participants' simulation files. For the 2011 evaluation, the resulting solution was to calculate energy and demand savings in the Performance Plus program using the unitary savings calculated in the EEH program since the methodology was identical. Accordingly, the gross savings calculations of the 2011 Performance Plus program included most EEH program evaluation features. Then, Econoler fine-tuned EEH program savings data using outcomes from the participant survey made with Performance Plus program participants.

The participant survey and builder interviews provided information to calculate the net-to-gross ratio for this program, including free-ridership, internal spillover and market effects. The NTGR established was used to calculate program net savings.

### **4.2 GROSS SAVINGS**

As mentioned previously, the 2011 evaluation of Performance Plus program gross savings is essentially based on the EEH program gross savings analysis. Within this latter program analysis, Econoler estimated the gross savings through the comparative analysis of the program tracking sheet data with the results of 23 project simulations, as well as through a review and proper adjustment of prescriptive measure savings. All the details of this analysis can be found in the EEH program evaluation report.

In summary, Econoler used four key parameters for evaluating Performance Plus program gross savings:

- > For the gross energy savings calculation, the parameters are the incremental energy savings value per increase of EnerGuide point and the independent savings per prescriptive measure installed.
- > For the gross demand savings calculation, the parameters are the energy-to-demand ratio and the unitary demand savings per electric thermal storage (ETS) system installed.

The next sections detail the gross savings calculations for each of these four features.

#### **4.2.1 Energy Savings Calculation**

The next sections present the three key features used for calculating energy savings under the Performance Plus program, namely the EnerGuide baseline, the savings per EnerGuide point value and the prescriptive measure savings figures.

##### **New House EnerGuide Baseline**

The Performance Plus program calculates energy savings generated by new high-efficiency houses through the comparison with standard new houses being built in Nova Scotia. While in 2009 the EnerGuide rating of new houses that complied with minimum standards<sup>6</sup> was deemed to be 73, this value was increased to 80 as part of the 2010 program evaluation. This was made to concur with the change in Nova Scotia building code minimum requirements, which came into force in early January 2010<sup>7</sup>.

Considering that the baseline EnerGuide rating of 80 is fairly high for new houses, ENSC suspected that the residential buildings built to code in 2011 should have a lower EnerGuide rating than this figure. Accordingly, four studies were performed in 2011 with a view to fine-tuning the baseline EnerGuide value to be used for energy savings calculations. The results of these studies are presented in the next table, along with the sample size and methodology.

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<sup>6</sup> Source: NEXUS 2009 Impact Report.

<sup>7</sup> Since January 1, 2010, the residential energy code of Nova Scotia features more stringent minimum energy efficiency requirements. This improvement of residential construction standards affected the minimum energy efficiency of new houses in Nova Scotia. For additional information: <http://www.gov.ns.ca/lwd/buildingcode/docs/NSBuildingCodeAct.pdf>.

**Table 15: Results of the EnerGuide Baseline Studies**

| No | Author                                        | Methodology                                                                                                                                                 | Sample Size | Air Change Rate (ACH <sub>50</sub> ) <sup>8</sup> | Range of EnerGuide Ratings Calculated | Average EnerGuide Rating |
|----|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------------|---------------------------------------|--------------------------|
| 1  | Nova Scotia Home Builders Association (NSHBA) | Modeling of Performance Plus homes by using the prescriptive standards                                                                                      | 63          | 4.55                                              | 71 to 84                              | 77.4                     |
| 2  | NSHBA                                         | Modeling of Performance Plus homes by using the prescriptive standards                                                                                      | 34          | 3.57                                              | 72 to 80                              | 76.8                     |
| 3  | Natural Resources Canada (NRCan)              | Results for homes built in 2010 in Nova Scotia that have come under the ecoENERGY / EnerGuide for Homes program, but not under the Performance Plus program | 27          | 2.47                                              | 66 to 85                              | 76.9                     |
| 4  | Sustainable Housing                           | Results from tests of homes that were built to code in 2011                                                                                                 | 10          | 1.45                                              | 77 to 81                              | 79.1                     |

The first three studies demonstrated that the average EnerGuide rating should be around 77 for new houses being built to code in Nova Scotia. On the other hand, the last study suggested that this baseline rating should be higher than that (79). Here are the key findings of this baseline study review:

- > The last table shows that the average air change rate varies significantly from one study to another. While the two NSHBA studies were made assuming that the average air change rate in new houses would be higher than 3.5 ACH<sub>50</sub>, NRCan's results showed that the average air change rate in new houses being built in 2010 would be rather around 2.5 ACH<sub>50</sub>. In comparison, the 266 Performance Plus homes completed in 2011 whose final air change rate was entered in the program tracking sheet had an average air change rate of 1.9 ACH<sub>50</sub>. Similarly, the 10 homes tested by Sustainable Housing had an average air change rate of 1.45 ACH<sub>50</sub>. Since the ACH<sub>50</sub> value of a house affects significantly its EnerGuide rating, the NSHBA's study may have calculated a higher average EnerGuide rating if the assumed average air change rate had been lower.
- > The NRCan study used data from homes that were built in 2010. A number of these homes might not have come under the new code, which was put into force in January 2010.

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<sup>8</sup> ACH<sub>50</sub>: air changes per hour at a pressure difference of 50 Pascals. This is the standard SI unit for reporting the blower-door test results.

- > The main shortcoming of the Sustainable Housing study was the low sample size used. In addition, ENSC claimed that a number of the sampled homes went beyond the minimum code requirements, which would translate into calculating higher EnerGuide ratings.

In light of the above, the Evaluator elected to use 78 as the EnerGuide rating baseline value for calculating program gross savings.

### **Savings per EnerGuide Point**

ENSC calculates most of the energy savings of the Performance Plus program using an incremental savings coefficient per increase of EnerGuide point (also referred to as “savings per EnerGuide point”). In ENSC’s methodology, each EnerGuide point over the baseline rating of 80 accounted for 1,032 kWh of annual savings for 2011 gross impact calculations. The 1,032 kWh savings figure comes from the 2010 Performance Plus program evaluation report. In addition, the savings per EnerGuide point were calculated only when the main heat source of the house was electricity, regardless of the share of electricity in delivering heating throughout the year. In contrast, ENSC did not claim savings when the main heat source was not electricity (oil, natural gas, etc.), even though the backup heating system was electric.

For the 2011 Performance Plus program evaluation, Econoler used the same energy savings coefficients as those calculated in the 2011 EEH program evaluation. For this program evaluation, Econoler conducted several analyses for confirming the savings per EnerGuide point figure of ENSC. The details of these analyses are included in the EEH program evaluation report. The main features of this work are summarized below.

First, Econoler established a representative sample of 23 EEH projects. Subsequently, Econoler evaluated the average value of savings per EnerGuide point of the sample projects using the initial and final energy consumption data simulated with HOT2000 in relation with the respective EnerGuide ratings. The overall average of these savings values per project amounted to 1,089 kWh of savings per EnerGuide point.

Econoler performed a linear regression analysis, based on the initial and final building energy consumption of all EEH sample projects as a function of the respective EnerGuide rating of each project. Through this regression analysis (which was proven statistically acceptable), the Evaluator found a regression coefficient (1,052 kWh) almost equal to the previously calculated EnerGuide savings per point (1,089 kWh). Econoler decided to use the first energy savings coefficient (i.e., 1,089 kWh per EnerGuide point) as a basis for energy savings computation.



Econoler noted that the EEH HOT2000 simulations tended to overestimate residential building electricity consumption. A billing analysis of 23 EEH sample projects<sup>9</sup> was therefore conducted to evaluate the accuracy of the results obtained from the HOT2000 simulations. This analysis demonstrated that the HOT2000 software seems to overestimate the consumption by at least approximately 25 percent. As a result, this last percentage was used to lower the evaluated average savings per EnerGuide point (1,089 kWh) previously defined. This yielded a final value of **817 kWh** of savings per EnerGuide point.

With regard to the fact that ENSC claimed 100 percent of EnerGuide point increase savings for houses whose main heat source is electricity and no savings for all other new houses, Econoler assessed the potential effect of this assumption on gross impact calculations using the tracking sheet data. Among the 701 participants of 2011, 655 houses had electricity as their primary space heating energy and 95 of these participants had a secondary space heating system installed (mainly propane, natural gas and wood systems). In comparison, only two houses out of the 46 whose primary heating energy was not electricity had a secondary space heating system powered with electricity. The tracking sheet showed that the other 44 houses had no secondary heating system installed.

This last assumption from ENSC may tend to overestimate program gross impacts. Nevertheless, trying to estimate the percentage of electrical heating in participating houses that have more than one heating energy sources was not possible with the information included in the final version of the program tracking sheet. Econoler therefore decided to keep this assumption as is in its gross impact calculations.

## **Prescriptive Measure Savings**

In addition to the savings per EnerGuide point coefficient, ENSC calculated incremental savings for a set of prescriptive measures that are not taken into account in HOT2000 simulations. The savings values used by ENSC for this calculation are taken from the 2010 Performance Plus program evaluation report.

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<sup>9</sup> Econoler conducted a billing analysis of 17 of the 23 EEH sample projects. In fact when analyzing the data received, Econoler found that six out of the 23 sets of data were considered unreliable. More specifically, five of these six projects had a very small energy consumption compared to typical values expected for a home in Nova Scotia. For the other project, the format of the billing data was not standard, which made the data unusable. These six series of billing energy consumption data were therefore discarded before performing the billing analysis.

When evaluating the Performance Plus program, Econoler confirmed that there were five prescriptive measures that did not have their energy savings computed in HOT2000 building consumption simulations:

- > drain water heat recovery with an efficiency between 30 and 42 percent;<sup>10</sup>
- > drain water heat recovery with an efficiency of 42 percent or greater;
- > electric hot water heater pipe insulation;
- > programmable thermostats; and
- > energy-efficient lighting products.

In the above list, additional savings were taken into consideration for the first three prescriptive measures as long as the domestic water heating system was electric. For the programmable thermostat measure, energy savings were calculated only when the primary space heating energy was electricity. In regard to the energy-efficient lighting products, energy savings were calculated for all program participants.<sup>11</sup> The energy savings resulting from these five prescriptive measures are defined in Table 16.

Moreover, two other prescriptive measures had savings taken into account in Econoler's impact calculations, namely the installation of electric hot water heater tank wraps and solar domestic hot water heaters. Since the energy savings related to these measures were calculated in HOT2000 simulations, Econoler added energy savings to the simulation results for these two prescriptive measures only when the main energy source of the space heating system was not electricity. The water heating source also had to be electricity.

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<sup>10</sup> In fact, only two projects involved the drain water heat recovery measure with efficiency of 30% to 41.9%. These two projects were therefore automatically chosen when performing the sampling.

<sup>11</sup> For the savings calculations of this prescriptive measure, Econoler assumed that this measure involved the installation of 13 watt compact fluorescent lamps (CFLs) in lieu of 60 watt incandescent lamps. This is by far the most common energy efficiency measure in residential lighting. The savings for this prescriptive measure were calculated in the EEH evaluation report.

The next table highlights the seven prescriptive measures for which Econoler took into account additional savings per measure. The savings values of ENSC along with those of Econoler are also included in the table below.

**Table 16: Annual Energy Savings of the Prescriptive Measures**

| <b>Prescriptive Measures</b>                                     | <b>ENSC Annual Savings (kWh)</b> | <b>Evaluated Annual Savings (kWh)</b> |
|------------------------------------------------------------------|----------------------------------|---------------------------------------|
| Drain Water Heat Recovery with an Efficiency between 30% and 42% | 820                              | 816                                   |
| Drain Water Heat Recovery with more than 42% Efficiency          | 1,026                            | 816                                   |
| Electric Hot Water Heater Pipe Insulation                        | 74                               | 74                                    |
| Electric Hot Water Heater Tank Wraps <sup>12</sup>               | 399                              | 270                                   |
| Programmable Thermostats                                         | 63                               | 221                                   |
| Solar Domestic Hot Water Heating (Solar DHW) <sup>12</sup>       | 2,080                            | 1,622                                 |
| 13 Watt CFLs                                                     | 41                               | 46.3                                  |

Econoler calculated all of the above annual savings values as part of the EEH program evaluation process. The corresponding evaluation report presents all details of this analysis.

#### **4.2.2 Demand Savings Calculation**

The demand savings of the Performance Plus program are calculated using two different considerations. Firstly, Econoler calculated the demand savings using an energy-to-demand ratio of 3.77 GWh/MW. This ratio was obtained from the adjusted 2011 program targets, by dividing the target energy savings (in GWh) by the target peak demand savings (in MW). The use of this ratio for demand saving calculations was confirmed by ENSC.

Secondly, Econoler added to this calculated demand savings value the estimated amount of demand savings realized through the installation of ETS units. ETS systems reduce electricity demand by storing heat during off-peak demand hours of the day and releasing it during on-peak hours. In the Performance Plus program, three ETS measures are approved for implementation in residential buildings, namely ETS forced air furnaces, ETS central hydronic systems and ETS room units.

For the first two ETS systems (forced air furnaces and central hydronic systems), ENSC estimated the average demand savings per system at 45 kW. On the other hand, ENSC estimated the demand savings for ETS room units at 10 kW per unit.

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<sup>12</sup> Additional savings calculated only if there is no electrical space heating and if the water heating system is electrical.

In the 2011 EEH program evaluation report, Econoler assessed the validity of these two demand savings values (10 kW and 45 kW). Upon completion of this evaluation, Econoler calculated the annual demand savings for the installation of each ETS system with the following coefficient:

- > ETS forced air furnaces: 10 kW per project;
- > ETS central hydronic systems: 10 kW per project;
- > ETS room units: 4 kW per unit, up to 10 kW per project.

#### **4.2.3 Revised Gross Savings**

Energy and demand savings for the program were revised to reflect the calibrated savings per EnerGuide rating point and the savings from prescriptive measures presented in previous sections. For the calculation of savings at generator level, Econoler used a line loss factor of 10.5 percent, which takes into account transmission and distribution losses. This value was provided by Nova Scotia Power.

The total savings obtained for the EEH program are presented in the next table.

**Table 17: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                       | Savings per EnerGuide Point* | DWHR** (eff. = 30% to 42%) | DWHR** (eff. ≥ 42%) | Pipe Insulation | Tank Wraps*** | Program-mable Thermostats | Solar DHW*** | 13 Watt CFLs | ETS Forced Air Furnaces | ETS Central Hydronic Systems | ETS Room Units |
|--------------------------------------------------------|------------------------------|----------------------------|---------------------|-----------------|---------------|---------------------------|--------------|--------------|-------------------------|------------------------------|----------------|
| <b>Energy Savings</b>                                  |                              |                            |                     |                 |               |                           |              |              |                         |                              |                |
| Number of Units                                        | 684                          | 2                          | 44                  | 41              | 0             | 225                       | 0            | 5,071        | 0                       | 24                           | 12             |
| Unitary Savings (kWh)                                  | 817                          | 816                        | 816                 | 74              | 270           | 221                       | 1,622        | 46.3         | N/A                     | N/A                          | N/A            |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>     | <b>3.105</b>                 | <b>0.002</b>               | <b>0.036</b>        | <b>0.003</b>    | <b>0</b>      | <b>0.050</b>              | <b>0</b>     | <b>0.235</b> | <b>N/A</b>              | <b>N/A</b>                   | <b>N/A</b>     |
| Line Loss Factor                                       | 1.105                        | 1.105                      | 1.105               | 1.105           | 1.105         | 1.105                     | 1.105        | 1.105        | N/A                     | N/A                          | N/A            |
| <b>Total Gross Energy Savings – at Generator (GWh)</b> | <b>3.431</b>                 | <b>0.002</b>               | <b>0.040</b>        | <b>0.003</b>    | <b>0</b>      | <b>0.055</b>              | <b>0</b>     | <b>0.259</b> | <b>N/A</b>              | <b>N/A</b>                   | <b>N/A</b>     |
| <b>Demand Savings</b>                                  |                              |                            |                     |                 |               |                           |              |              |                         |                              |                |
| Unitary Savings (kW)                                   | N/A                          | N/A                        | N/A                 | N/A             | N/A           | N/A                       | N/A          | N/A          | 10                      | 10                           | 4              |
| Energy-to-Demand Ratio (GWh/MW)                        | 3.77                         | 3.77                       | 3.77                | 3.77            | 3.77          | 3.77                      | 3.77         | 3.77         | N/A                     | N/A                          | N/A            |
| <b>Total Gross Demand Savings – at Meter (MW)</b>      | <b>0.824</b>                 | <b>0.0004</b>              | <b>0.010</b>        | <b>0.001</b>    | <b>0</b>      | <b>0.013</b>              | <b>0</b>     | <b>0.062</b> | <b>0</b>                | <b>0.240</b>                 | <b>0.048</b>   |
| Line Loss Factor                                       | 1.105                        | 1.105                      | 1.105               | 1.105           | 1.105         | 1.105                     | 1.105        | 1.105        | 1.105                   | 1.105                        | 1.105          |
| <b>Total Gross Demand Savings – at Generator (MW)</b>  | <b>0.910</b>                 | <b>0.0005</b>              | <b>0.011</b>        | <b>0.001</b>    | <b>0</b>      | <b>0.015</b>              | <b>0</b>     | <b>0.069</b> | <b>0</b>                | <b>0.265</b>                 | <b>0.053</b>   |

\* In the "Savings per EnerGuide Point" column, the number of units is in fact the number of participants where an energy audit was conducted and for which the Evaluator calculated savings per EnerGuide point. The unitary savings value shown in this column is the savings per EnerGuide point figure calculated through the EEH program impact evaluation.

\*\* DWHR: Drain Water Heat Recovery

\*\*\* Energy savings for hot water tank wraps and solar domestic hot water heating (solar DHW) were calculated only when there was no electrical space heating and when the water heating system was electric.

Taking everything into account, the 2011 overall gross energy savings for the Performance Plus programs are respectively estimated at 3.20 GWh at the meter and at 3.53 GWh at the generator. Furthermore, the 2011 total gross peak demand savings for this program are respectively estimated at 1.14 MW at the meter and at 1.26 MW at the generator.

Upon completion of the gross savings calculation, Econoler identified a series of opportunities for improving future impact calculations. Accordingly, Econoler recommends that ENSC:

- > **Collect the building energy consumption data for each house:** The Evaluator recommends calculating the energy savings of each participant through the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.
- > **Revise HOT2000 models on a random basis:** The Evaluator or the PM should revise a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor.
- > **Add a percentage of heating delivered by electricity:** For the year 2011, ENSC claimed 100 percent of EnerGuide point increase savings for houses whose main heating source was electricity even if there was a non-electric backup heating system installed. This assumption increases the uncertainty in gross impact calculations and may also tend to increase the overall energy savings of the program. Consequently, Econoler believes that ENSC's tracking sheet should include a percentage (ranging from 0 to 100%) to take into account houses that are not fully heated with electricity year-round. In the EEH program savings calculations, this percentage is collected for each participant and the claimed savings are then adjusted in relation with this value. The savings claimed per participant are thus more representative of electricity heating system operations. This information can be collected from HOT2000 simulation results. The delivery agents should be able to verify this information on site during their audit with program participants.

## **4.3 INTERACTIVE EFFECTS**

In a residence, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. In the case of the Performance Plus program, installing energy-efficient lighting products (CFLs) instead of standard incandescent bulbs causes an increase in the heating load during winter and a decrease in the cooling load during summer. Indeed, CFLs release less heat than the less efficient lamps they replace.

For CFLs installed in 2011, an interactive effects factor of -29.1 percent was used for this year's evaluation. To calculate this factor, Econoler based its assessment on a study conducted by ADS in 1992 for Hydro-Québec.<sup>13</sup> The work done in this study was intended to modify certain parameters in simulations of an average home in Quebec to determine the impact of these changes on the interactive effects. The simulations were performed with the DOE-2<sup>14</sup> software and only focused on homes heated entirely by electricity. The simulations were carried out considering three scenarios for interactive effects: low, moderate and high. The scenario with minimum interactive effects was selected for 2011 program impact calculations because it enabled the Evaluator to account for the evolution of construction practices in the residential sector since 1992.

Then, the Evaluator adjusted the interactive effects factors from the ADS study using the proportion of space heating provided by electric systems among Performance Plus program participants. The program tracking sheet showed the primary energy source used for space heating of each program participant (electricity, oil, natural gas, wood pellets, etc.). Econoler thus calculated the average percentage of electric heating in those participant houses, which resulted in 94 percent of program participant households being mainly heated with electric heating systems.<sup>15</sup> Then, Econoler divided the houses mainly heated with electricity on the basis of whether they had air source heat pumps (ASHPs) or ground source heat pumps (GSHPs) installed (57% of total) or only electric baseboards (37% of total). For those who had an ASHP or a GSHP as their main heating system, Econoler used an average coefficient of performance (COP) of 4 to adjust the potential interactive effects on the electricity consumption of heating systems.

To take into account interactive effects on space cooling, Econoler adjusted the interactive effects factor in relation with the proportion of houses that had air conditioning units or systems installed. This percentage was taken from Statistics Canada,<sup>16</sup> which states that 18 percent of households have air conditioning in their residence.

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<sup>13</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

<sup>14</sup> DOE-2 is a widely used and accepted software building energy analysis program developed under funding from the U.S. Department of Energy.

<sup>15</sup> For this calculation, 700 of the 701 participants of the Performance Plus program had their primary space heating fuel written in the tracking sheet. 655 of these participant houses were mainly heated with electric systems.

<sup>16</sup> Statistics Canada (CANSIM), Households having air conditioning, Nova Scotia, 2009.

The following table presents the calculation details of the interactive effects. It reflects the proportion of residences in Nova Scotia that are mainly heated by electricity and those that have air conditioning units or systems.

**Table 18: Interactive Effects Factor for CFLs**

| <b>Parameters</b>                                      | <b>% of Residences</b> | <b>Interactive Effects</b> |
|--------------------------------------------------------|------------------------|----------------------------|
| Electric Baseboard Heating with Air Conditioning       | 37% x 18% = 6.7%       | -54.4%                     |
| Electric ASHP or GSHP Heating with Air Conditioning    | 57% x 18% = 10.3%      | -10.9%                     |
| Electric Baseboard Heating Without Air Conditioning    | 37% x 82% = 30.3%      | -58.0%                     |
| Electric ASHP or GSHP Heating Without Air Conditioning | 57% x 82% = 46.7%      | -14.5%                     |
| No Electric Heating with Air Conditioning              | 6% x 18% = 1.1%        | 3.6%                       |
| No Electric Heating Without Air Conditioning           | 6% x 82% = 4.9%        | 0%                         |
| <b>Weighted Interactive Effects Factor</b>             | <b>100%</b>            | <b>-29.1%</b>              |

For pipe insulation and hot water tank wraps installed through the Performance Plus program, interactive effects of -100 percent were considered during the heating period in electrically heated houses. This estimation is based on the fact that, when there is no insulation, all the heat lost through the pipes and the hot water tank is released into the room. Assuming that the pipes and tank are located in a heated room, it means that 100 percent of the energy released from the hot water is used for the heating load. Conversely, during the cooling period, interactive effects are estimated at +100 percent in houses that use air conditioning. Based on the heating and cooling degree-days for the region of Halifax,<sup>17</sup> Econoler considered an eight-month period of heating and a two-month period of cooling in the interactive effects calculation.

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<sup>17</sup> RETScreen International, Normalized climate data for Halifax International Airport, Natural Resources Canada, 1997-2010.



The table below presents the details for the calculation of interactive effects for water pipe insulation and hot water tank wraps. As for lighting products, the table shows the proportion of residences in Nova Scotia that are heated electrically and those that use air conditioning units or systems. This calculation resulted in a weighted interactive effects factor of -31.3 percent.

**Table 19: Interactive Effects Factor for Pipe Insulation and Hot Water Tank Wraps**

| Parameters                                             | % of Residences             | Interactive Effects during Heating Period | Interactive Effects during Cooling Period |
|--------------------------------------------------------|-----------------------------|-------------------------------------------|-------------------------------------------|
| Electric Baseboard Heating with Air Conditioning       | $37\% \times 18\% = 6.7\%$  | $-100\% \times 8/12 = -67\%$              | $+100\% \times 2/12 = +17\%$              |
| Electric ASHP or GSHP Heating with Air Conditioning    | $57\% \times 18\% = 10.3\%$ | $-25\% \times 8/12 = -17\%$               | $+100\% \times 2/12 = +17\%$              |
| Electric Baseboard Heating Without Air Conditioning    | $37\% \times 82\% = 30.3\%$ | $-100\% \times 8/12 = -67\%$              | $0\% \times 2/12 = 0\%$                   |
| Electric ASHP or GSHP Heating Without Air Conditioning | $57\% \times 82\% = 46.7\%$ | $-25\% \times 8/12 = -17\%$               | $0\% \times 2/12 = 0\%$                   |
| No Electric Heating with Air Conditioning              | $6\% \times 18\% = 1.1\%$   | $0\% \times 8/12 = 0\%$                   | $+100\% \times 2/12 = +17\%$              |
| No Electric Heating Without Air Conditioning           | $6\% \times 82\% = 4.9\%$   | $0\% \times 8/12 = 0\%$                   | $0\% \times 2/12 = 0\%$                   |
| <b>Weighted Interactive Effects Factor</b>             | <b>100%</b>                 | <b>-34.3%</b>                             | <b>3.1%</b>                               |
|                                                        |                             | <b>-31.3%</b>                             |                                           |

For all other products installed through this program in 2011, interactive effects were considered as negligible.

## 4.4 NET-TO-GROSS RATIO

The NTGR evaluation of the program is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on participants' decision to implement program-eligible energy efficiency measures. These questions were included in the participant survey.

This section presents the methodology used to transform responses to NTGR survey questions into a NTGR. For the program, the NTGR includes the assessment of three distortion effects: free-ridership, internal spillover and market effects. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{Net-to-gross ratio} = (1 - \% \text{ free-ridership} + \% \text{ internal spillover} + \% \text{ market effects})$$

#### **4.4.1 Free-Ridership**

Free-ridership occurs when participants declare that they would have implemented the energy efficiency measures in the absence of the program. The free-ridership level was measured for this program through a participant survey conducted with homeowners as well as through interviews with participating builders. The questionnaire included six questions that intended to assess:

- > if homeowners had any plans to build or buy a house reaching an EnerGuide rating of 83 or higher before participating in the program;
- > the probability that homeowners would have built or bought a house with the same level of energy efficiency if they had not participated in the program;
- > the probability that homeowners would have built or bought a house with an EnerGuide rating under 83, instead of a house with a higher level of energy efficiency, if they had not participated in the program;
- > the probability that homeowners would have built or bought a house with the same level of energy efficiency but at a later date if they had not participated in the program;
- > the probability that homeowners would have paid the full cost of the additional energy efficiency measures required to reach the EnerGuide rating of 83 or higher; and
- > the influence of the program on homeowners' decision to build or buy a house reaching an EnerGuide rating of 83 or higher.

The participating builder interview guide included questions that intended to assess:

- > the probability that builders would have built the same number of houses with an EnerGuide rating of 83 or higher if they had not participated in the program;
- > the probability that builders would have installed the same measures with the exact same level of efficiency if they had not participated in the program; and
- > the influence of the program on builders' decision to build houses reaching an EnerGuide rating of 83 or higher.

Each group of questions was transposed into a level of program attribution used to calculate the general free-ridership level for each homeowner or builder. The involvement of either the builder or the homeowner in the decision to participate in the program was also taken into consideration in the algorithm: 67 percent of homeowners mentioned being behind the decision to take part in the program, whereas in 33 percent of the time, it was the builders. The algorithm behind this calculation is presented in Appendix VI.

The most important elements of the approach previously used to estimate the free-ridership level of the program were preserved in Econoler's approach. However, a few enhancements were incorporated:

- > Introduction of a 0 to 10 scoring system rather than fixed categories that were assigned weights.

- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participant energy efficiency decision making rather than focusing narrowly only on their rating of program importance. This question structure more accurately reflects the complex nature of the real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania.

Using this approach, survey and in-depth interview results revealed a free-ridership level of 37 percent among homeowners and 23 percent among builders, for an overall free-ridership level of 32 percent. This free-ridership level is substantially lower than the results obtained during last year's evaluation (54%). Furthermore, while the free-ridership level calculated among builders is significantly lower compared to the 2010 evaluation (79%), the free-ridership level among homeowners dropped slightly from 52 percent (2010) to 37 percent (2011) between both evaluations. This difference in builder free-ridership level could be due in part to the enhancements made to the approach to evaluating free-ridership.

#### **4.4.2 Internal Spillover**

The participant survey was also used for assessing internal spillover. In the case of the Performance Plus program, internal spillover can occur when participants declare that, following their previous participation, they have implemented additional energy efficiency measures that were recommended in their plan evaluation and energy audit report. When such was the case, additional questions were used to identify the additional energy efficiency measures implemented and verify their validity by asking if participants benefited from other rebates from ENSC programs. Subsequently, other questions were asked to quantify the level of influence the program had on their decision to implement these additional measures. Depending on the level of influence obtained during the survey, a portion of the savings related to the additional measures was attributed to the program.

The level of internal spillover was calculated for each participant according to the equation below. The energy savings (kWh) associated with the additional energy efficiency measures are estimated using the savings estimations provided in the audit report.

$$\%SO = \frac{kWh \text{ associated with the additional measures} \times \text{attribution level}}{kWh \text{ associated with the program participation}}$$

Past evaluations did not capture any internal spillover for this program. This year, the impact evaluation revealed an extremely low level of internal spillover. Only six participants declared having implemented (or are currently implementing) additional energy-efficient products (CFLs) in their house, following their previous participation in the program. These additional energy-efficient products

correspond to energy savings attributable to the program totalling 7.8 MWh, which accounts for approximately 0.2 percent of total gross energy savings. Therefore, no spillover was considered for the 2011 program impacts.

#### **4.4.3 Market Effects**

The marketing of the Performance Plus program is primarily conducted through builders who receive promotion and awareness documents on various energy efficiency measures. Consequently, market effects can occur when a builder decides to implement energy efficiency measures in new constructions without participating in the program.

Ten in-depth builder interviews were conducted in order to measure these potential market effects. Eight of these 10 builders were participants in 2011 while the other two builders decided not to participate in the program. Questions were asked to understand how program promotion affected builders' design decisions and verify if, under the program's influence, they had built houses that would probably reach an EnerGuide rating of 83 or higher without participating in the program. Only one participating builder mentioned having done so. One non-participating builder also mentioned having implemented energy efficiency measures that were promoted by the program (lighting and insulation measures). These two builders were then asked to determine the number of houses that had been built without participating in the program, to name Performance Plus measures that had been implemented in those houses and to quantify the influence of the program on building decisions.

The compilation of responses resulted in market effects of 5 percent. The market effects calculated for participating builders (1.7%) were significantly lower than those estimated in relation with non-participating builder interviews (8%). This would be mainly due to the fact that 95 percent of the houses constructed by the participating builders in 2011 were covered under the Performance Plus program. Then, Econoler calculated the average market effects for 2011 giving equivalent weight to both market effect percentages found; i.e., from participating and non-participating builder interviews. The final market effects were therefore evaluated at 5 percent for 2011.

In light of the above, Econoler recommends increasing the number of interviews with participating and non-participating builders in future evaluations to have a better chance of capturing higher and potentially more significant market effects. Furthermore, the participating builders who had been selected for the interviews were considered as having completed the highest number of construction projects through the Performance Plus program in 2011, which was confirmed by the very low percentage of houses built without benefiting from the program (5%). Participating builders to be interviewed should be selected more randomly.

## **4.5 NET SAVINGS**

The net savings for the program were estimated using the interactive effects factors and the NTGR above. The equation below was used to calculate the net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive Effects Factor}) \times \text{NTGR}$$

This equation was used for both demand and energy savings. The results obtained are presented in the next table.

**Table 20: Evaluation Results – Net Energy and Demand Savings**

| Product Category                                         | Savings<br>per<br>EnerGuide<br>Point* | DWHR**<br>(eff. =<br>30% to<br>42%) | DWHR**<br>(eff. ≥<br>42%) | Pipe<br>Insulation | Tank<br>Wraps*<br>** | Program-<br>mable<br>Thermo-<br>stats | Solar<br>DHW*** | 13 Watt<br>CFLs | ETS<br>Forced<br>Air<br>Furnaces | ETS<br>Central<br>Hydronic<br>Systems | ETS<br>Room<br>Units |
|----------------------------------------------------------|---------------------------------------|-------------------------------------|---------------------------|--------------------|----------------------|---------------------------------------|-----------------|-----------------|----------------------------------|---------------------------------------|----------------------|
| <b>Energy Savings</b>                                    |                                       |                                     |                           |                    |                      |                                       |                 |                 |                                  |                                       |                      |
| Total Gross Energy Savings – at<br>Meter (GWh)           | 3.105                                 | 0.002                               | 0.036                     | 0.003              | 0                    | 0.050                                 | 0               | 0.235           | N/A                              | N/A                                   | N/A                  |
| Interactive Effects Factor                               | 0%                                    | 0%                                  | 0%                        | -31.3%             | -31.3%               | 0%                                    | 0%              | -29.1%          | N/A                              | N/A                                   | N/A                  |
| NTGR                                                     | 0.73                                  | 0.73                                | 0.73                      | 0.73               | 0.73                 | 0.73                                  | 0.73            | 0.73            | N/A                              | N/A                                   | N/A                  |
| <b>Total Net Energy Savings<br/>(GWh) – at Meter</b>     | <b>2.267</b>                          | <b>0.001</b>                        | <b>0.026</b>              | <b>0.002</b>       | <b>0</b>             | <b>0.036</b>                          | <b>0</b>        | <b>0.122</b>    | <b>N/A</b>                       | <b>N/A</b>                            | <b>N/A</b>           |
| Line Loss Factor                                         | 1.105                                 | 1.105                               | 1.105                     | 1.105              | 1.105                | 1.105                                 | 1.105           | 1.105           | N/A                              | N/A                                   | N/A                  |
| <b>Total Net Energy Savings<br/>(GWh) – at Generator</b> | <b>2.505</b>                          | <b>0.001</b>                        | <b>0.029</b>              | <b>0.002</b>       | <b>0</b>             | <b>0.040</b>                          | <b>0</b>        | <b>0.134</b>    | <b>N/A</b>                       | <b>N/A</b>                            | <b>N/A</b>           |
| <b>Demand Savings</b>                                    |                                       |                                     |                           |                    |                      |                                       |                 |                 |                                  |                                       |                      |
| Total Gross Demand Savings – at<br>Meter (MW)            | 0.824                                 | 0.000                               | 0.010                     | 0.001              | 0                    | 0.013                                 | 0               | 0.062           | 0                                | 0.240                                 | 0.048                |
| Interactive Effects Factor                               | 0%                                    | 0%                                  | 0%                        | -31.3%             | -31.3%               | 0%                                    | 0%              | -29.1%          | 0%                               | 0%                                    | 0%                   |
| NTGR                                                     | 0.73                                  | 0.73                                | 0.73                      | 0.73               | 0.73                 | 0.73                                  | 0.73            | 0.73            | 0.73                             | 0.73                                  | 0.73                 |
| <b>Total Net Demand Savings<br/>(MW) – at Meter</b>      | <b>0.601</b>                          | <b>0.0003</b>                       | <b>0.007</b>              | <b>0.0004</b>      | <b>0</b>             | <b>0.010</b>                          | <b>0</b>        | <b>0.032</b>    | <b>0</b>                         | <b>0.175</b>                          | <b>0.035</b>         |
| Line Loss Factor                                         | 1.105                                 | 1.105                               | 1.105                     | 1.105              | 1.105                | 1.105                                 | 1.105           | 1.105           | 1.105                            | 1.105                                 | 1.105                |
| <b>Total Net Demand Savings<br/>(MW) – at Generator</b>  | <b>0.664</b>                          | <b>0.0003</b>                       | <b>0.008</b>              | <b>0.0004</b>      | <b>0</b>             | <b>0.011</b>                          | <b>0</b>        | <b>0.036</b>    | <b>0</b>                         | <b>0.194</b>                          | <b>0.039</b>         |

The Evaluator compared the net energy savings values calculated in the previous table with the Performance Plus program tracked net savings for 2011. The next table details the final evaluated and tracked impacts for 2011.

**Table 21: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|-----------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                               |             |                    |
| Tracked Savings from ENSC | 2.948 GWh                    | 2.948 GWh                                     | 0.46        | 1.356 GWh          |
| <b>Evaluation Results</b> | <b>3.791 GWh</b>             | <b>3.361 GWh</b>                              | <b>0.73</b> | <b>2.454 GWh</b>   |
| <b>Demand Savings</b>     |                              |                                               |             |                    |
| Tracked Savings from ENSC | 1.560 MW                     | 1.560 MW                                      | 0.46        | 0.717 MW           |
| <b>Evaluation Results</b> | <b>1.324 MW</b>              | <b>1.180 MW</b>                               | <b>0.73</b> | <b>0.861 MW</b>    |

As per the last table, the evaluated net energy savings exceeded those tracked by ENSC by more than 80 percent. This is mainly due to the adjustment of the house rating baseline value used for calculating the savings per EnerGuide point, from 80 to 78. The Evaluator also added the energy and demand savings realized through the installation of efficient lighting products, which were not taken into consideration in the initial tracking sheet provided by ENSC. In addition, the NTGR calculated for 2011 (0.73) is higher than that calculated as part of the 2010 program evaluation (0.46). This increase of the program NTGR is particularly imputable to the changes in the approach to evaluating the free-ridership level.

Despite the fact that ENSC and Econoler used the same energy-to-demand ratio, the realization rate for net demand savings only amounts to 120 percent as opposed to the 180 percent figure attributed to energy savings. The reason for this is that Econoler adjusted significantly the unitary peak demand savings related to the installation of ETS systems. Econoler deemed that the unitary demand savings used by ENSC were not conservative and; consequently, the former conducted a short survey of building simulations to fine-tune the latter. As a result, these demand savings were reduced by more than 75 percent.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b> | <b>1. Determine the required fields and remove those that are unnecessary:</b> The PM, together with the Evaluator, should determine what fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered for these fields. Conversely, the fields that are not utilized should be removed from the tracking sheet in order to concentrate the efforts on the essential.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                               | <b>2. Delete fields for individual measures savings for which energy savings are included in the EnerGuide rating:</b> Currently, each measure has an associated field indicating the related annual energy savings. These savings were shown for reference purposes and were not used by ENSC for overall program savings calculations. After analyzing simulations under HOT2000, only four of these measures were found not to affect the computed EnerGuide ratings. As a result, the energy savings associated with the measures have to be added in separate columns. These measures are as follows: programmable electronic thermostats, electric water heater pipe wraps, drain water heat recovery (DWHR) with an efficiency below 42 percent and DWHR with an efficiency above 42 percent. The Evaluator suggests removing the fields that are not necessary to calculate the energy savings including the “estimated kWh savings for individual measures” column to facilitate understanding of the tracking sheet. |
|                               | <b>3. Differentiate the applicant:</b> The building owner, the occupant or the builder can apply for the Performance Plus program. For tracking purposes, the Evaluator suggests creating separate fields for each.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                               | <b>4. Create fields for building energy consumption data:</b> Currently, energy savings are calculated using the EnerGuide rating. It may be suitable and more accurate to calculate them with the energy consumption data from HOT2000. Econoler recommends adding fields for building energy consumption per year in kWh for both a baseline house built to code and the house as completed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                               | <b>5. Ensure that all fields are systematically filled in:</b> Once the necessary fields are identified, it is recommended that they be systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On-Site Visits</b>           | <b>6. Explain in detail the protocol to the clients:</b> The energy advisor should explain carefully the different elements of the protocol to the clients (program process, incentives, booklets, resulting report, concepts under the EnerGuide rating and HOT2000 simulations, etc.). Participants may have difficulties understanding a number of these concepts.                                                                                                                                                                                       |
|                                 | <b>7. Document house parameters:</b> The architectural elements of the houses (building faces, foundation and roof) should be photographed in order to keep a record and create more precise HOT2000 models. This is especially true when the simulations are made at a certain time upon completion of the site visit. This practice also allows for the verification of the simulation data entries by a third party that has not been on site.                                                                                                           |
|                                 | <b>8. Enforce the protocol procedures for performing blower door tests:</b> In light of the on-site visits conducted, the Evaluator identified two relevant mistakes in conducting the blower door tests, namely advisors did not block the blower door opening during the initial test and failed to take the temperature on site during the visit. These practices may influence significantly the HOT2000 simulation and thereby the calculated EnerGuide rating.                                                                                        |
|                                 | <b>9. Encourage the energy advisor to provide participants with booklets:</b> Under its ecoENERGY program, NRCan developed a series of booklets for home owners aiming to explain energy efficiency concepts and potential measures for reducing energy consumption (such as the free guide “Keeping the Heat In”). Since residential participants often have a low understanding of the proposed energy efficiency measures, such informational tools might increase the likelihood of participants agreeing with the recommendations of the audit report. |
| <b>Participant Perspectives</b> | <b>10. Improve program communication:</b> The main recommendations expressed by homeowner participants were related to communication improvements. More specifically, the surveyed participants suggested improving the program by offering more information on the measures recommended and increasing program advertising. Moreover, the fact that some respondents stated that ENSC should add measures to the program that were already covered by the latter, shows that improving program communication is necessary.                                 |
|                                 | <b>11. Focus on energy bill savings and rebates in program’s marketing:</b> Program marketing should continue to emphasize the energy bill savings and rebates offered through the program since they are the main motives for participation.                                                                                                                                                                                                                                                                                                               |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Impact Evaluation</b> | <p><b>12. Collect the building energy consumption data for each house:</b> The Evaluator recommends calculating the energy savings of each participant through the energy consumption data simulated by HOT2000. The energy consumption difference between the baseline and the completed house would correspond to the savings. Then, this savings figure may have to be adjusted as a function of the calibration of HOT2000 simulation results (refer to Section 4.2.1 for additional information). This way of calculating the savings would be more tailored to the reality of each building than by using an average savings per EnerGuide point for all program participants.</p>                                                                                                                                                                                                                                                                                                                                                                                           |
|                          | <p><b>13. Revise HOT2000 models on a random basis:</b> The Evaluator or the PM should revise a small percentage of the HOT2000 models on a random basis to validate the input data. The energy advisors would have to keep detailed records (plans, notes, pictures) in order to be able to provide them for thorough reviewing. The amount of reviews should at least correspond to one project per energy advisor.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                          | <p><b>14. Add a percentage of heating delivered by electricity:</b> For the year 2011, ENSC claimed 100 percent of EnerGuide point increase savings for houses whose main heating source was electricity even if there was a non-electric backup heating system installed. This assumption increases the uncertainty in gross impact calculations and may also tend to increase actual energy savings. Consequently, Econoler believes that ENSC's tracking sheet should include a percentage (ranging from 0 to 100%) to take into account houses that are not fully heated with electricity year-round. In the EEH program savings calculations, this percentage is collected for each participant and the claimed savings are then adjusted in relation with this value. The savings claimed per participant are thus more representative of electricity heating system operations. This information can be collected from HOT2000 simulations results. The delivery agents should be able to verify this information on site during their audit with program participants.</p> |
|                          | <p><b>15. Increase the number of in-depth interviews with home builders:</b> When conducting in-depth interviews with builders, the Evaluator noted that one participating builder mentioned having built houses that would have reached an EnerGuide rating of 83, but without participating in the program. One non-participating builder also mentioned having implemented energy efficiency measures that were promoted by the program. However, the low sample of interviewed builders (10) prevented the Evaluator from clearly determining whether this finding would translate into more substantial market effects than those calculated in relation with the builder interview results. Consequently, Econoler recommends increasing the number of interviews with participating builders in future evaluations to have a better chance of capturing potentially more significant market effects.</p>                                                                                                                                                                    |

## APPENDIX II - DEMOGRAPHICS

The majority of respondents reside in detached single-family homes (87%), and a small number live in mobile homes or house trailers (6%).

**Table 22: Type of Residence**

|                                             | Owners |      |      |
|---------------------------------------------|--------|------|------|
|                                             | 2009   | 2010 | 2011 |
| <i>Sample Size</i>                          | 10     | 43   | 70   |
| Detached single-family home                 | 8      | 86%  | 87%  |
| Townhouse or duplex                         | 1      | 12   | --   |
| Semi-detached house                         | 1      | 2    | 1    |
| Mobile home or house trailer                | --     | --   | 6    |
| Row house (single-story apartment building) | --     | --   | --   |
| Apartment building, less than 5 stories     | --     | --   | --   |
| Apartment building, at least 5 stories      | --     | --   | --   |
| Other                                       |        |      | 3    |
| Don't know                                  |        |      | 3    |

Six in 10 homes have three bedrooms (63%) while three in 10 have four or more bedrooms (28%).

**Table 23: Number of Bedrooms**

| Number of Bedrooms in Home | Owners |      |      |
|----------------------------|--------|------|------|
|                            | 2009   | 2010 | 2011 |
| <i>Sample Size</i>         | 10     | 43   | 70   |
| 0                          | --     | ---  | --   |
| 1                          | --     | --   | 1%   |
| 2                          | --     | 16%  | 7    |
| 3                          | 7      | 56   | 63   |
| 4                          | 3      | --   | 17   |
| 5+                         | --     | 7    | 11   |

Four in 10 respondents have two people in their household (43%) while one half have three or more people living in their household (48%).

**Table 24: Number of Residents**

| Number of Full-Time Residents | Owners    |           |           |
|-------------------------------|-----------|-----------|-----------|
|                               | 2009      | 2010      | 2011      |
| <i>Sample size</i>            | <i>10</i> | <i>43</i> | <i>70</i> |
| 1                             | 1         | 12%       | 9%        |
| 2                             | 2         | 44        | 43        |
| 3                             | 3         | 9         | 23        |
| 4                             | 3         | 21        | 23        |
| 5                             | 1         | 7         | 1         |
| 6+                            | --        | 5         | 1         |
| Don't Know/refused            | --        | 2         | --        |

Nearly all participants reported that their home is occupied year round (99%).

**Table 25: Type of Home**

| Type of Home           | Owners    |           |           |
|------------------------|-----------|-----------|-----------|
|                        | 2009      | 2010      | 2011      |
| <i>Sample Size</i>     | <i>10</i> | <i>43</i> | <i>70</i> |
| All year               | 10        | 98%       | 99%       |
| Seasonal/vacation home | --        | --        | 1         |
| Don't know/refused     | --        | 2         | --        |

Participants have a mix of ages, with nearly six in 10 between the age of 25 and 44 (57%).

**Table 26: Age**

| Age                | Owners    |           |           |
|--------------------|-----------|-----------|-----------|
|                    | 2009      | 2010      | 2011      |
| <i>Sample Size</i> | <i>10</i> | <i>43</i> | <i>70</i> |
| 18-24              | --        | --        | 3%        |
| 25-34              | 2         | 9%        | 33        |
| 35-44              | 6         | 44        | 24        |
| 45-54              | 1         | 16        | 19        |
| 55-64              | 1         | 21        | 16        |
| 65+                | --        | 7         | 4         |
| Refused            | --        | 2         | 1         |

Two-thirds of survey participants have a college or university degree (66%).

**Table 27: Education**

| Education                                    | Owners    |           |           |
|----------------------------------------------|-----------|-----------|-----------|
|                                              | 2009      | 2010      | 2011      |
| <i>Sample Size</i>                           | <i>10</i> | <i>43</i> | <i>70</i> |
| Less than high school graduation certificate | --        | 2%        | 3%        |
| High-school grad and/or some post-secondary  | --        | 19        | 16        |
| Trades certificate or diploma                | --        | 5         | 4         |
| College certificate or diploma               | 2         | 19        | 17        |
| University certificate or diploma            | 8         | 53        | 49        |
| Other                                        | --        | --        | 7         |
| Refused                                      | --        | --        | 4         |

Over one-half of participants have a household income of \$80,000 or more (53%).

**Table 28: Income**

| Household Income   | Owners    |           |           |
|--------------------|-----------|-----------|-----------|
|                    | 2009      | 2010      | 2011      |
| <i>Sample Size</i> | <i>10</i> | <i>43</i> | <i>70</i> |
| Less than \$15,000 | --        | 2%        | --        |
| \$15,000-\$24,999  | --        | --        | --        |
| \$25,000-\$34,999  | --        | 2         | --        |
| \$35,000-\$49,999  | --        | 5         | 10%       |
| \$50,000-\$69,999  | 1         | 5         | 11        |
| \$70,000-\$79,999  | --        | 9         | 11        |
| \$80,000 or more   | 9         | 42        | 53        |
| Refused            | --        | 35        | 13        |
| Don't know         | --        | --        | 1         |

Seven in 10 respondents were female (69%) while three in 10 were male (31%).

**Table 29: Gender**

| Gender             | Owners    |           |           |
|--------------------|-----------|-----------|-----------|
|                    | 2009      | 2010      | 2011      |
| <i>Sample Size</i> | <i>10</i> | <i>43</i> | <i>70</i> |
| Male               | 8         | 63%       | 69%       |
| Female             | 2         | 37        | 31        |

## **APPENDIX III - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Performance Plus (New Houses Program)**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: 2010 Evaluation Report</b> |
|---------------------------------------|

### **Page 16 of the executive summary section 3.7**

Q: What is the status related to the 2 observations of the evaluator?

1. It seems the program is mostly a heat pump program
2. The level of free-ridership for builders and owners are high (70% and 52%)

### **Page 4**

NH-R1: What is the status of this recommendation?

NH-R3: What is the status of this recommendation?

Q: What measure or study has been initiated to establish where exactly is the base line (or standard practice) for new construction?

### **Page 5**

NH-25: What is the status of this recommendation?

NH-R6: What is the status of this recommendation?

NH-R7: What is the status of this recommendation?

NH-R8: This is an important finding and recommendation. What is the status?

NH-R9: This is also an important finding. What is the status?

---

**Page 13**

C: The program logic model: In our opinion, the “Energy Savings and Bill Reduction” bubble” should be moved to the Short Term Outcome section. Care to comment?

Q: Also the logic model does not show what happens to houses heated by other energy sources. Is it only a different source of funding but the model is still the same and ENSC is in charge of both cases (electricity and other energy sources?)

|                              |
|------------------------------|
| <b>Source: Web site ENSC</b> |
|------------------------------|

**Page 1**

Q: We notice yet another change of name to Performance Plus. Before it used to be EnerGuide for New Houses and also R-2000. Care to comment? Is it just because there are more rebates?

Q: If the EnerGuide audit recommends the installation of one or more of the measures for which ENSC provides additional incentives, to reach a score higher than 83, does that mean that the participant can receive both incentives (one for achieving 83 and over and one for the measure? Even if it's because of that measure that the 83 rating has been reached? Does that mean that the participant receives two incentives for the same measure?

**Page 2**

C: The information on the Web is very comprehensive and clear.

**Page 3**

Q: What is the rationale behind the eligibility criteria: “ A home with electric baseboards as its primary heating source is not eligible” for less than 1,600 ft<sup>2</sup>?

**Rebate Guide**

Q: On the Web site we see only incentives to electricity measures. In the program manual we have both incentives coming from rate-payer funds and coming from provincial funds, Why is that?



|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

Q: To whom this program manual it intended? ENSC, delivery agents, Participants, all of them?

C: I understand that the Province of Nova Scotia will subsidize only houses that use other sources of energy than electricity and that the registration of these houses goes first to ENSC then to the Province? Or does ENSC manage both funds?

**Page 2**

Q: The second paragraph is not clear as to what funds goes to whom and for what. I need clarification.

C: The program has changed names at least 3 times from EnerGuide for New Houses, to R-2000 to Performance Plus. Care to comment on these changes?

**Page 8**

Q: If the regulation represents a minimum score of 80, why do you provide an incentive for the audit cost for that level?

**Page 9**

Q: It seems that there are many parties involved in that program (NRCan, 3 service providers, the energy advisors, the Province, ENSC, the builders, etc.). With a program that changes content and name often, does that represent a hurdle to a proper program implementation?

**Page 10**

C: The marketing initiative seems to have a comprehensive cover. Do you intend to collect performance indicators (PI) for all those activities?

**Page 11 – table 4.3.1**

Q: Do you use deemed savings for the measures described in pages 5 to 8? Or do you calculate them individually?

Q: If they are deemed savings do you have all the variables that were used to calculate these savings and are they up to date or validated by the previous evaluators?

C: Conducting further research to establish where is the true baseline for this program is an excellent practice

## **Page 12**

C: The written description of the program procedures is very helpful. But there are two sections here that do not apply to everyone. For example item 1 to 5 are for the participants and the different allies, while item 6 to 14 are more for internal administrative procedure for ENSC.

Q: Would it be adequate to separate the two series and provide with a process flow chart to support the writing?

### **Appendix A (participant form)**

Primary observation on the form:

On the top right hand side the form should carry the same name as the official name of the program to avoid any confusion.

The form should have also a revision date somewhere at the bottom of the form.

Utility Account Number: Do we presume there is only one utility for all participants (NSP), if not, we should include also the utility name.

Rebates of less than 100\$ will not be paid: Please explain the reason

Since it's the homeowner or the builder who signs the form, we need to have a box check to identify who is signing this form, the builder or the owner in case we need some clarification or contact that person for evaluation purposes.

### **Assignment of rebate to builder**

Insert a form ID and revision date for tracking purposes.

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Please describe who are the delivery agents or service provider as you call them), how many are they (3?), and what are their specific roles in the program so we can develop adequate question for the process interviews.

Q: Did the program design include a certain level of free-ridership? If yes, how was it quantified?

C: Knowledge and lack of training of builders related to the new legislation seems to be barriers to the program. Care to comment?

Q: Do you perform a cost effectiveness test after each evaluation?

Q: Initially, when the program was launched, was there an evaluation plan attached to it?

Q: Are there any known barriers to that program?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database? (1 is very difficult 10 is very easy)

Q: Do you have any other subject you wish us to investigate with the program partners who will be part of the process evaluation?

Thank you very much for your collaboration and the time you took to answer our questions.

## **APPENDIX IV - INTERVIEW GUIDES WITH BUILDERS**

### **PARTICIPATING BUILDER INTERVIEW GUIDE**

#### **ENSC PERFORMANCE PLUS PROGRAM**

October 27, 2011

Hello, may I please speak with \_\_\_\_\_?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

#### **INTRODUCTION**

Hello, I am from Econoler. I am calling on behalf of Efficiency Nova Scotia Corporation for the Performance Plus program.

#### **[TO BE READ IF NECESSARY]**

The program is also known as the "New Houses" program. Throughout the interview, I will refer to it as the "Performance Plus" program.

#### **IDENTIFICATION AND SCREENING OF RESPONDENT**

- I1. According to our records, your company has participated in the Performance Plus program from Efficiency Nova Scotia. Econoler has been mandated by Efficiency Nova Scotia to conduct an evaluation of this program. We have a few questions about your company's participation in this program. Specifically, I'd like to speak with someone from your company who is knowledgeable about the construction projects that your firm has completed in the course of 2011. Would that person be you?

\_Person responsible available [CONTINUE TO I2]

\_Person responsible currently unavailable [ARRANGE CALL BACK WITH THE RIGHT PERSON]

- \_No person responsible [CONTINUE INTERVIEW - CONTINUE TO I2]
- \_Don't know [CONTINUE INTERVIEW - CONTINUE TO I2]
- \_Refused [THANK AND TERMINATE]

### **Confidentiality**

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses.

### **Recording of the Interview**

Please note that the interview will be recorded for transcription purposes only. The recording will remain strictly confidential.

I2. What is your job title?

-----

### **ACTIVITIES OF THE FIRM**

We will start with questions that will help us understand the main activities of your firm.

A1. Approximately how many new residential building unit constructions, including single units, semi-attached units and multi-family units, has your firm completed so far in 2011 in Nova Scotia?

A2. What type(s) of residential units do you normally build?

[ASK IF MORE THAN ONE TYPE MENTIONED IN A2]

A2a. For each type mentioned, how many units have you built so far in 2011 in Nova Scotia? (or try to get a percentage per type) [IF RESPONDENT FINDS IT DIFFICULT TO GIVE AN EXACT NUMBER, ASK FOR A PERCENTAGE OF ANSWER TO A1]

- A3. Among the residential units that you have built so far in 2011 in Nova Scotia, how many have been built under the Performance Plus program?

### **VERIFICATION OF MEASURES IMPLEMENTED**

We will now talk about the construction projects that your firm has completed through the Performance Plus program during 2011.

- V1. What measures promoted by the program do you normally implement in houses as part of your participation in the Performance Plus program?

[IF RESPONDENT IS NOT ABLE TO ANSWER, READ CATEGORIES BELOW]

- ☐ HVAC system - Specify: \_\_\_\_\_
- ☐ Water heating system - Specify: \_\_\_\_\_
- ☐ Lighting equipment – Specify: \_\_\_\_\_
- ☐ Building envelope - Specify: \_\_\_\_\_
- ☐ Other - Specify: \_\_\_\_\_

### **FREE-RIDERSHIP**

- FR1. Without the Performance Plus program and its rebate, would you have built the same number of houses with the exact same level of efficiency, reaching an EnerGuide rating of 83 or higher?

- ☐ Yes
- ☐ No [GO TO FR1a]
- ☐ Don't know
- ☐ Refused

- FR1a. From the (refer to number given in A3) houses built under the program, how many houses with an EnerGuide rating of 83 would you have built if you had not participated in the Performance Plus program?

Enter number:

FR2. I would like you to consider what actions you would have taken in the absence of the Performance Plus program.

If you had not participated in the Performance Plus program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale from 0 to 10, where 0 means that you “Definitely **Would Not** Have Taken the Action,” and 10 that you “Definitely **Would Have** Taken the Action.”

FR2a. Without the Performance Plus program, would you have installed HVAC equipment with the exact same level of efficiency in the houses that you built, reaching the same EnerGuide rating of 83 or higher?

Scale:

☐ Don't Know

☐ Refused

FR2b. Without the Performance Plus program, would you have installed lighting with the exact same level of efficiency in the houses that you built, reaching the same EnerGuide rating of 83 or higher?

Scale:

☐ Don't Know

☐ Refused

FR2c. Without the Performance Plus program, would you have installed windows and doors with the exact same level of efficiency in the houses that you built, reaching the same EnerGuide rating of 83 or higher?

Scale:

☐ Don't Know

☐ Refused

FR2d. Without the Performance Plus program, would you have installed wall and roof insulation levels with the exact same level of efficiency in the houses that you built, reaching the same EnerGuide rating of 83 or higher?

Scale:

☐ Don't Know

☐ Refused

FR3. Now, I'm going to ask you to rate the importance of the Performance Plus program as well as of other factors that might have influenced your decision to build houses with a high level of energy efficiency and achieve an EnerGuide rating of 83 or higher. Using a scale from 0 to 10, where 0 means "Not at all important" and 10 means "Extremely important," please rate the importance of each of the following in your decision to achieve an EnerGuide rating of 83 or higher for your new houses.

| Factors                                                                                                                                | Responses                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| a. The program incentive                                                                                                               | Scale <input type="checkbox"/> Don't Know <input type="checkbox"/> Refused |
| b. Program promotion or information                                                                                                    | Scale <input type="checkbox"/> Don't Know <input type="checkbox"/> Refused |
| c. Feedback received from the review of home plans                                                                                     | Scale <input type="checkbox"/> Don't Know <input type="checkbox"/> Refused |
| d. The EnerGuide label and designation itself                                                                                          | Scale <input type="checkbox"/> Don't Know <input type="checkbox"/> Refused |
| e. Previous experience with the Performance Plus program, or a similar program either from Efficiency Nova Scotia or Nova Scotia Power | Scale <input type="checkbox"/> Don't Know <input type="checkbox"/> Refused |



**Market effects**

M1. In 2011, have you built energy-efficient houses with an EnerGuide rating of 83 or higher without participating in the Performance Plus program?

☐ Yes [GO TO M1a]

☐ No

☐ Don't know

☐ Refused

M1a. How many houses have you built without participating in the program?

Enter number:

M2. What measures promoted by the Performance Plus program have you implemented in those houses but not as part of the program?

M3. Why did you not ask for a rebate for those houses?

M4. What is the likelihood that you would have built those houses if you had never participated in the Performance Plus program? Please answer on a scale from 0 to 10, where 0 means "very unlikely" and 10 "very likely."

Scale:

**END:** Those are all the questions I have for you today. Do you have anything to add regarding the program, your participation in the program or this interview?

Thank you very much for your collaboration and the time you took to answer our questions.

## **NON-PARTICIPATING BUILDER INTERVIEW GUIDE**

### **ENSC PERFORMANCE PLUS PROGRAM**

October 27, 2011

#### **INTRODUCTION**

Hello, I am from Econoler. I am calling on behalf of Efficiency Nova Scotia Corporation for the Performance Plus program.

[TO BE READ IF NECESSARY]

The program is also known as the “New Houses” program. Throughout the interview, I will refer to it as the “Performance Plus” program.

#### **IDENTIFICATION AND SCREENING OF RESPONDENT**

- I1. We have been mandated by Efficiency Nova Scotia Corporation to evaluate its Performance Plus program. We would appreciate your collaboration in answering questions related to your knowledge and perception of the program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program.
- I2. Before today, had you ever heard of the Performance Plus program?
- ☐ Yes [GO TO I2a]
- ☐ No [READ I2\_1]
- ☐ Don't know [READ I2\_1]
- ☐ Refused [READ I2\_1]

- I2\_1. Are you sure? This program provides rebates for implementing energy-efficient upgrades in newly constructed houses and residential buildings. Plans for the house are reviewed and recommendations are given for upgrades to implement in the new homes. The home buyer can receive rebates to cover some of the cost of eligible measures.

[IF STILL SAYS NO, DON'T KNOW OR REFUSED, THANK AND TERMINATE]

- I3. Has your firm participated in the Performance Plus program in 2011?

- ☐ Yes [ASK PARTICIPATING QUESTIONS]  
☐ No, our firm has not participated in 2011 [CONTINUE]  
☐ Don't know [READ I3\_1]  
☐ Refused [READ I3\_1]

- I3\_1. Are you sure? This program provides rebates for implementing energy-efficient upgrades in newly constructed houses and residential buildings. Plans for the house are reviewed and recommendations are given for upgrades to implement in the new homes. The home buyer can receive rebates to cover some of the cost of eligible measures. [IF STILL SAYS DON'T KNOW OR REFUSED]: Is there someone else who would know about having participated in the Performance Plus program? Could I speak to that person please?

- \_Person responsible available [CONTINUE TO I4]  
\_Person responsible currently unavailable [ARRANGE CALL BACK WITH RIGHT PERSON]  
\_No person responsible [CONTINUE INTERVIEW - CONTINUE TO I4]  
\_Don't know [CONTINUE INTERVIEW - CONTINUE TO I4]  
\_Refused [THANK AND TERMINATE]

### **Confidentiality**

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses.

### **Recording of the Interview**

Please note that the interview will be recorded for transcription purposes only. The recording will remain strictly confidential.

I4. What is your job title?

-----

### **ACTIVITIES OF THE FIRM**

We will start with questions that will help us understand the main activities of your firm.

A1. Approximately, how many new residential building unit constructions, including single units, semi-attached units and multi-family units, has your firm completed so far in 2011 in Nova Scotia?

A2. What type(s) of residential units do you normally build?

[ASK IF MORE THAN ONE TYPE MENTIONED IN A2]

A2a. For each type mentioned, how many units have you built so far in 2011 in Nova Scotia? [IF RESPONDENT FINDS IT DIFFICULT TO GIVE AN EXACT NUMBER, ASK FOR A PERCENTAGE OF ANSWER TO A1]

A3. Has your firm ever participated in the Performance Plus program?

☐ Yes

☐ No

☐ Don't know

☐ Refused

A4. For what reason(s) has your firm chosen not to participate in the Performance Plus program in 2011?

- ☐ Negative past experience with this program or with another utility program
- ☐ Too much paperwork
- ☐ It is always too long to receive the rebates
- ☐ It is always too long to receive progress documents (recommendations, report, etc.)
- ☐ Did not want the program to restrict our building decisions
- ☐ Time period to complete the house is too short
- ☐ Other – Specify: \_\_\_\_\_
- ☐ Don't know
- ☐ Refused

**Market effects**

M1. In 2011, has your firm implemented energy-efficient measures promoted by the Performance Plus program in its new residential units?

- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Refused

- M2. What energy-efficient measures has your firm implemented in those new residential units?
- M3. What percentage of these measures would you not have implemented if the program had not been implemented (point out promotion of energy efficiency measures through builders associations)?
- M4. How has the Performance Plus program influenced your building decisions in 2011? Please give your answer on a scale from 0 to 10, where 0 means that the Performance Plus program “has had no influence at all on your building decisions” and 10 that the program has been “extremely influential in your building decisions.”
- Scale:
- M5. From all of the residential units that you have built so far in 2011, how many have been built under the influence of the Performance Plus program? [IF THE RESPONDENT CANNOT PROVIDE AN EXACT NUMBER, ASK FOR A PERCENTAGE]
- Enter number:
- M6. Besides the Performance Plus program, what influences your building decisions? (Bring up homeowner requests, market trends, etc.)

**END:** Those are all the questions I have for you today. Do you have anything to add regarding the program or this interview?

Thank you very much for your collaboration and the time you took to answer our questions.

## **APPENDIX V - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant questionnaire**

### **Performance Plus Program**

October 14, 2011

Hello may I please speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

### **INTRODUCTION**

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your household recently participated in Efficiency Nova Scotia Corporation's Performance Plus program for new houses. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

The Performance Plus program may also be known as "EnerGuide for New Houses" or "R2000". Throughout the questionnaire, I will refer to it as the "Performance Plus program".

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

### **Section V - Verification and Recall**

V1. We understand you participated in the Performance Plus program for the house you built or are building at [ADDRESS FROM FILE]. Is that correct?

1. Yes [CONTINUE]
2. No [PROMPT: "Are you sure? This program provides rebates for installing energy efficient upgrades in newly constructed houses and residential buildings. Plans for the house are reviewed and recommendations are given for upgrades to install in the new homes. The home buyer can receive rebates to cover some of the cost of eligible measures." RECODE AS "YES" IF THE PROMPT WORKS; IF RESPONDENT STILL

SAYS NO: "Is there someone else who would know about having participated in the Performance Plus program?"]

1. Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]
98. Don't know [PROMPT: "This program provides rebates for installing energy efficient measures in newly constructed houses and residential buildings. Plans for the house are reviewed and recommendations are given for upgrades to install in the new homes. The home buyer can receive rebates to cover some of the cost of eligible upgrades after they are installed." RECODE AS "YES" IF THE PROMPT WORKS; IF RESPONDENT STILL SAYS DON'T KNOW: "Is there someone else who would know about having participated in the Performance Plus program?"]
  1. Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]
  2. No [THANK & TERMINATE]
99. Refused [THANK AND TERMINATE]

[IF REFUSED, ASK "Can we schedule a more convenient time for you to conduct this survey?"]

[SCHEDULED, IF NECESSARY, FOR: \_\_\_\_\_]

V2. Are you in the business of building and/or selling homes?

1. Yes [THANK & TERMINATE]
2. No [CONTINUE]
98. (Don't know) [THANK & TERMINATE]
99. (Refused) [THANK & TERMINATE]

V3. Did you personally take part in the decision to participate in the Performance Plus program?  
[DO NOT READ. ACCEPT ONE]

1. (Yes)
2. (No/The Builder made the decision)
98. (Don't know)
99. (Refused)



- V4. Did you take part in the decisions regarding the energy efficiency measures to install through the Performance Plus program? [DO NOT READ. ACCEPT ONE]
1. (Yes)
  2. (No/The Builder made the decision)
  98. (Don't know)
  99. (Refused)
- V5. Which of the following statements would you say best describes when you became involved in the decisions about the energy efficiency of your home? Would you say... READ STATEMENTS IN ORDER – CODE ONE ONLY
1. You were involved from the initial planning and design stage. This is when your home existed only on paper.
  2. You were involved after the plans for your home were finalized but before the energy efficiency measures were installed.
  3. You were involved after the energy efficiency measures were installed but before the Final Review of your completed home, or
  4. You were not involved in any of these decisions or bought the home after it was completed.
  98. (Don't know)
  99. (Refused)

#### **Section P – Program Notoriety and Reasons for Participating – Homeowners**

- P1. How did you learn about the Performance Plus program? [DO NOT READ. ACCEPT MULTIPLE]
1. (Efficiency Nova Scotia bill insert)
  2. (A utility other than Efficiency Nova Scotia)
  3. (Efficiency Nova Scotia's Website)
  4. (Through program delivery agent from Nova Scotia Home Builders Association (NSHBA))
  5. (Through program delivery agent from Sustainable Housing & Education Consultants (SHEC))
  6. (Through delivery agent from Amerispec Inspection Services)
  7. (Natural Resources Canada Website)
  8. (Nova Scotia Home Builders Association's member list)
  9. (The Internet)
  10. (Radio Ad)
  11. (Newspaper/Renovation Guide Ad or Story)

12. (Home show)
13. (Signs on stakes)
14. (Seminar or information session put on by delivery agent)
15. (From a contractor)
16. (Efficiency Nova Scotia on-hold message)
17. (Word of mouth -- neighbor, friend, co-worker, family member, etc.)
18. (Builder/construction trade publication)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

[IF V3=1, CONTINUE OTHERWISE SKIP TO S1]

P2. Now I'm going to ask you to think back to when you decided to participate in the Performance Plus program. What was the SINGLE most important reason you were interested in participating in the program? [ACCEPT ONE RESPONSE; DO NOT READ; PROBE FOR SPECIFIC REASONS]

1. (To have a house that would save on energy costs/bills)
2. (I was thinking about/planning to get energy efficient measures in my house anyway)
3. (To find out how energy efficient the new house would be/to get house evaluated)
4. (To get expert advice about what measures to install/how to make home more energy efficient)
5. (To help save energy—not further specified whether for cost, environment)
6. (To help the environment)
7. (To get rebates for measures that were already in the house I bought)
8. (I was interested in getting a better, more energy efficient home)
9. (I am generally interested in energy efficiency and renewable energy)
10. (I had previously worked with other energy efficiency programs)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

P3. Were there any other reasons? [SAME LIST AS P2 ABOVE. DO NOT READ. ACCEPT MULTIPLE; PROBE FOR SPECIFIC REASONS.]

P4. Before participating, did you have any concerns about taking part in the program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

[IF P4 = 1]

P5. What were those concerns? [DO NOT READ. ACCEPT ALL RESPONSES]

- 1. (That my "bottom line" would suffer/I wouldn't recover the cost of installing energy efficient measures in house I'm building)
- 2. (The measures would cost a lot)
- 3. (My houses were already energy efficient)
- 4. (I wouldn't like what they recommended)
- 5. (I wouldn't like what was installed)
- 6. (Customers wouldn't like what I installed)
- 96. (Other)(Specify:\_\_\_\_\_)
- 97. (Don't know)
- 98. (Refused)

### **Section S – Satisfaction with program – Homeowners**

S1. Thinking of your OVERALL experience with the Performance Plus program up to this point, including any services received or energy efficient upgrades installed, how satisfied are you overall with the program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

- 1. Very satisfied
- 2. Satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Dissatisfied
- 5. Very Dissatisfied
- 98. (Don't know)
- 99. (Refused)

[IF S1 = 4 or 5]

S2. You indicated that you were not satisfied with the program overall. What was the SINGLE most important reason you were not satisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]

1. (The review of the plans took too long)
2. (Took too long to receive rebate)
3. (Took too long to install the measures)
4. (Too much paperwork)
5. (Rebates were too small)
6. (Not enough items covered by program)
7. (Did not like the recommendations)
8. (Did not like what was installed)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

[IF S1 = 4 or 5]

S3. Were there any other reasons you were dissatisfied? [SAME LIST AS S2 ABOVE. DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

[IF V5=3, 4, 98 OR 99, SKIP TO FR1]

S4. Now I'm going to ask you about your experience with specific aspects of the Performance Plus Program. Using a scale from 1 to 5, where 1 means "very dissatisfied" and 5 means "very satisfied", please tell me how satisfied you are with your experience with each aspect of the program. DO NOT RANDOMIZE. DO NOT ACCEPT A RANGE.

[IF V5=1, ASK ALL a thru g]

[IF V5=2, ASK ONLY d thru g]

- |    |                                                                                                                                                                     |   |   |   |   |   |       |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|-------|
| a. | The First Review of the house plans, overall<br>(This was the review of the house plans,<br>evaluating the house's energy efficiency<br>with recommended measures.) | 1 | 2 | 3 | 4 | 5 | 98/99 |
| b. | Scheduling and timing of the review                                                                                                                                 | 1 | 2 | 3 | 4 | 5 | 98/99 |
| c. | The report you received about<br>the house plan's current energy efficiency                                                                                         | 1 | 2 | 3 | 4 | 5 | 98/99 |

|    |                                                                                                                                                                                      |   |   |   |   |   |       |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|-------|
| d. | Recommendations for energy efficient measures                                                                                                                                        | 1 | 2 | 3 | 4 | 5 | 98/99 |
| e. | The Final Energy Audit Overall<br>(This was the final audit of the house's energy efficiency to determine the rating and confirm the energy efficient upgrades that were installed.) | 1 | 2 | 3 | 4 | 5 | 98/99 |
| f. | Scheduling and timing of the final audit                                                                                                                                             | 1 | 2 | 3 | 4 | 5 | 98/99 |
| g. | The rebates provided by the program overall                                                                                                                                          | 1 | 2 | 3 | 4 | 5 | 98/99 |

**[IF S4a = 1 or 2; OTHERWISE SKIP TO S7]**

S5. You indicated that you were not satisfied with the first review of the house plans. What was the SINGLE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE]

1. (The review of the plans took too long)
2. (It wasn't what I had expected)
3. (Too much paperwork)
4. (Not enough items covered by first review of the house plans)
5. (Didn't like the recommendations)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)

S6. Were there any other reasons you were dissatisfied with the energy efficiency review of the house plans? [SAME LIST AS S5 ABOVE. DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

**[IF S4e=1 or 2; OTHERWISE SKIP TO FR1]**

S7. You indicated you were not satisfied with the final energy audit. What was the SINGLE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE.]

1. (The final energy audit took too long)
2. (I did not get the EnerGuide rating I had expected)
3. (It was difficult to schedule the final energy audit)
4. (I found the energy evaluator to be unpleasant)
96. (Other) [SPECIFY \_\_\_\_\_]
98. (Don't know)
99. (Refused)

S8. Were there any other reasons you were dissatisfied with the final energy audit? [SAME LIST AS S7 ABOVE. DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

**[ASK FR SECTION IF V3=1 OR V4=1]**

**Section FR – Free-ridership - Homeowners**

FR1. When building a house in Nova Scotia to code, one would expect an EnerGuide rating of 80. Did you decide to build or buy a house with a high level of energy efficiency, reaching an EnerGuide rating of 83 or higher, before participating in the Performance Plus program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[IF FR1=YES]**

FR1a. I just want to make sure I understand - **Before** you decided to participate in the Performance Plus program, you had already made the decision to build or buy a house with a high level of energy efficiency, reaching an EnerGuide rating of 83 or higher?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Performance Plus program.

If you had not participated in the Performance Plus program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT, In the absence of the Program, would you have . . . : DO NOT ACCEPT A RANGE – ASK FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. ...built or bought a house with the exact same level of efficiency, reaching the same EnerGuide rating of 83 or higher?

\_\_\_Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2b. ...built or bought a standard house, with an EnerGuide rating under 83, instead of a house with a high level of energy efficiency that has an EnerGuide rating of 83 or higher?

\_\_\_ Response                      \_\_\_98 Don't Know     \_\_\_99 Refused

FR2c. ...built or bought a house with the exact same level of efficiency, reaching the same EnerGuide rating of 83 or higher, *but at a later date*?

\_\_\_ Response                      \_\_\_98 Don't Know     \_\_\_99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT ASK FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your response to a previous question that if the Performance Plus program had not been available there was an X in 10 likelihood that you would have built or bought a house with the exact same level of efficiency, reaching the same EnerGuide rating, *but at a later date*. Approximately how many months later would you have built or bought this house? **DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE**

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
97. (Don't Know)
98. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

**[ASK FR3\_1 IF, IN SAMPLE, TotalRebates>0]**

FR3\_1. Efficiency Nova Scotia paid you \$[TotalRebates] for the EnerGuide Rating of [FinalEnerGuideRating] that you achieved in your new house. If you had not received the rebate from Efficiency Nova Scotia, would you have paid for the full cost of the additional measures required to reach this EnerGuide Rating? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely Would Not Have Paid" and a 10 indicating that you "Definitely Would Have Paid." PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_ Response

96. (Did not receive that rebate)

97. (Don't Know)

98. (Refused)

**[ASK FR3\_2 IF, IN SAMPLE, TotalRebates=Empty]**

FR3\_2. Efficiency Nova Scotia gave you a rebate for the EnerGuide Rating of [FinalEnerGuideRating] that you achieved in your new house. If you had not received the rebate from Efficiency Nova Scotia, would you have paid for the full cost of the additional measures required to reach this EnerGuide Rating? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely Would Not Have Paid" and a 10 indicating that you "Definitely Would Have Paid." PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_ Response

97. (Did not receive that rebate)

98. (Don't Know)

99. (Refused)

FR4. Next, I'm going to ask you to rate the importance of the Performance Plus program as well as other factors that might have influenced your decision to build or buy a house with a high level of energy efficiency and achieved an EnerGuide rating of 83 or higher. Using a scale from 0 to 10, where 0 means "Not at all important" and 10 means "Extremely important", please rate the importance of each of the following in your decision to achieve an EnerGuide rating of 83 or higher for your new house.



| Factor<br>(READ AND RANDOMIZE)                                                                                                         | Responses                                         |
|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| a. The program incentive                                                                                                               | ___ Response    ___98 Don't Know    ___99 Refused |
| b. Information or advice provided by the program                                                                                       | ___ Response    ___98 Don't Know    ___99 Refused |
| c. Feedback received from the review of home plans                                                                                     | ___ Response    ___98 Don't Know    ___99 Refused |
| d. The EnerGuide Label and designation itself                                                                                          | ___ Response    ___98 Don't Know    ___99 Refused |
| e. Previous experience with the Performance Plus program, or a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ___ Response    ___98 Don't Know    ___99 Refused |

### Section SO – Spillover – Homeowners

SO1. Now I'd like you to think about the time since you participated in the Performance Plus program. Have you implemented any additional energy-efficient measures on your own for the house for which you participated in the program?

- 1. Yes
- 2. No [Go to IM1]
- 98. (Don't know) [Go to IM1]
- 99. (Refused) [Go to IM1]

SO3. Have the additional energy-efficient measures implemented benefited from any other financing or rebate from any other *Efficiency Nova Scotia* program, or do you plan to submit a funding request for these measures in the future?

- 1. Yes [Go to IM1]
- 2. No
- 98. (Don't know) [Go to IM1]
- 99. (Refused) [Go to IM1]

[IF SO3 = 2]

SO4. I would like to know what are the additional energy-efficient measures that you have implemented on your own after participating in the Performance Plus Program. Did you implement energy-efficient... **[READ IN ORDER]**

SO4a. Heating, Ventilating and Air conditioning (HVAC) equipment, such as the furnace?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4b. Tank wrap or pipe insulation equipment?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4c. Lighting equipment?

- 1. Yes
- 2. No
- 98. (Don't know)

SO4d. Other energy-efficient measures?

- 1. Yes [Please specify\_\_\_\_\_]
- 2. No
- 98. (Don't know)

[IF SO3 = 2]

- SO5. How influential was your experience with the energy-efficient measures implemented through the Performance Plus Program on your decision to implement some or all of these additional energy-efficient measures on your own? Please give your answer on a scale of 0 to 10, where 0 indicates that the Performance Plus “had no influence at all on your decision to implement additional energy-efficient measures” and 10 indicates that the program was “extremely influential in your decision to implement additional energy-efficient measures.”  
**[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

**Section IM - Impact of measures on comfort level and energy bills - Homeowners**

- IM1. Do you think the energy efficiency measures installed through the program have resulted in a more comfortable home for you and other occupants to live in?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)
- IM2. Compared to the energy bills you would have received if you had not installed the energy efficiency measures, do you think the energy efficiency measures installed through the program have resulted in a significantly lower energy bills?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

**Section RU - Receptivity to upgrades covered by programs, and other possible upgrades – Homeowners**

- RU1. Are there any energy efficiency upgrades that were not covered by the program that you would like to have had covered through the program?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

[IF RU1 = 1]

RU2. Which energy efficiency upgrades would you like to have had covered by the program?  
[PROBE FOR SPECIFIC UPGRADES; ACCEPT MULTIPLE] PROBE: Anything else?

**Section R - Recommendations for program improvements - Homeowners**

R1. Do you have any recommendations for improving the Performance Plus program? PROBE:  
Anything else?

1. (Offer more products/measures eligible to rebates)
2. (Offer more information on the products/measures recommended)
3. (Complete the first review of house plans faster)
4. (Complete the final audit of the house sooner)
5. (Improve communication)
6. (Advertise the program more or in a better way)
7. (No recommendation)
96. (Other [SPECIFY \_\_\_\_\_])
97. (Don't know)
98. (Refused)

R2. Would a figure illustrating the various steps to follow in order to participate in the Performance Plus Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?

1. \_\_\_ Significantly
2. \_\_\_ Somewhat
3. \_\_\_ Slightly
4. \_\_\_ Not at all
96. (Depends on what the figure or illustration would have been)
97. (This kind of document already exists)
98. (Don't know)
99. (Refused)

**Section D - Demographic characteristics**

**[ASK ALL HOME BUYERS]**

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. What type of residence do you live in? [READ RESPONSES 1-5; SELECT ONE RESPONSE]

1. Detached single-family home
2. Semi-detached house
3. Mobile home or house trailer
4. Townhouse or duplex which share adjacent walls
5. Row house (Single story apartment building)
96. Other [SPECIFY: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

D2. How many bedrooms are in your home? [98=DK; Enter zero for a studio apartment with no bedrooms]

D5. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home
96. (Other Specify \_\_\_\_\_)
98. (Don't know)
99. (Refused)

D6. Including yourself, how many people live in this residence on a full-time basis?

Number of people: \_\_\_\_\_

[NOTE: DON'T ALLOW ZERO FOR A RESPONSE]

D7. What is your age group? Are you...[READ]

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D8. What is the highest grade of schooling completed by the head of your household? [DO NOT READ]

1. (Less than high school graduation diploma)
2. (High school graduation diploma and/or some post-secondary)
3. (Trades certificate or diploma)
4. (College certificate or diploma)
5. (University degree, certificate or diploma)
98. (Don't know)
99. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2010? Stop me when I reach the right category. [READ LIST; SELECT ONE RESPONSE]

1. Less than \$15,000
2. \$15,000 - \$24,999
3. \$25,000 - \$34,999
4. \$35,000 - \$49,999
5. \$50,000 - \$69,999
6. \$70,000 - \$79,999
7. \$80,000 or more
98. (Don't know)
99. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK YOU FOR TAKING THE TIME TO RESPOND TO THIS SURVEY.]

---

## APPENDIX VI - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Performance Plus program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did you decide to build or buy a house with a high level of energy efficiency, reaching an EnerGuide rating of 83 or higher?                                                                                                                                                                         | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to build or buy a house reaching an EnerGuide rating of 83 or higher?                                                                                                                                                   | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have built or bought a house with the exact same level of efficiency, reaching the same EnerGuide rating of 83 or higher? (Scale 0 to 10)                                                                                                                           | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have built or bought a standard house instead of a house reaching an EnerGuide rating of 83 or higher? (Scale 0 to 10)                                                                                                                                              | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                     | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)</b>                                                                                                                                          |
| <b>FR3.</b> If you had not received the rebate from ENSC, would you have paid for the full cost of the additional measures required to reach this EnerGuide Rating?(Scale 0 to 10)                                                                                                                                                                    | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                     | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3</b>                                                                                                                             |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c, e = Program factors<br>Factors d= Non Program factors                                                                                                                                                                                                                              | FR4_P = SUM(a; b; c; e)<br>FR4_NP = FR4d                                                                                                                                         |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                     | <b>100% -<br/>[FR4_P/(FR4_P+FR4_NP)]</b>                                                                                                                                         |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have built or bought a house reaching the same EnerGuide rating of 83 or higher <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                         | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have built or bought this house ?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                     | <b>FR2cc</b>                                                                                                                                                                     |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                           | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                |

Subsequently, the final free-ridership level calculated for each participant was submitted to two inconsistency tests:

- > The first inconsistency test consisted in verifying if  $(FR2a - FR2b) \geq 30\%$ . In that case, the participant's answers to FR2a and FR2b represented an inconsistency and PA1 became equal to the smallest value between FR2a and FR2b. Otherwise, PA1 remained unchanged. Moreover, if the adjusted PA1 value was still  $\geq 50\%$  for a participant who had declared having decided to install the energy-efficient lighting products after learning about the program, PA1 was re-adjusted to 0%.
- > The second inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to FR3 represented an inconsistency and PA2 was removed from the final free-ridership calculation. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.





# **BUSINESS ENERGY REBATES PROGRAM IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 20, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Business Energy Rebates (BER) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and four participants, on 11 on-site visits as well as on a telephone survey of 43 program participants.

## **PROGRAM OVERVIEW**

The BER program provides financial incentives, in the form of prescriptive rebates, to commercial and industrial (C&I) clients to reduce electrical energy consumption and demand.

The prescribed measures are divided into seven categories:

- > Lighting Fixtures & Lamps;
- > Occupancy Sensors;
- > Motors & Variable-Speed Drives (VSDs);
- > Commercial Central Heating & Cooling (HVAC) systems;
- > Commercial Laundry Equipment;
- > Refrigeration Equipment; and
- > Compressed Air Equipment.

In 2011, program design and implementation was upgraded in several aspects. Notably, the PM held several meetings with sales representatives for each type of measure offered by the program so that they could be more proactive in promoting the program. Moreover, Efficiency Nova Scotia Corporation (ENSC) merged all five application forms for each measure category into a single model, which in turn eased the participant application process. ENSC also added free-ridership screening questions to all application forms. Finally, a participant process flow chart was developed by ENSC in order to make the program participation procedures clearer.

The program aimed to achieve net electricity savings of 21.80 GWh in 2011.

## **KEY FINDINGS**

The 2011 evaluation of the BER program demonstrated that the program is well designed and has a good potential for success. The program totalled 106 participants for the year 2011, which is a substantial increase compared to last year (13 participants), when the program started. In terms of net energy savings, the program generated 7.002 GWh, which represents a considerable increase in comparison to 2010 net savings (0.503 GWh).

## **Awareness**

In order for the number of participants to keep increasing and to ensure program continuity in the years to come, program awareness constitutes an important aspect of the program strategy. The evaluation revealed that the main source of awareness for the BER program were contractors. Moreover, three participants in 10 stated that a contractor had been responsible for specifying the measures to implement. These results highlight the importance of contractors in program promotion.

The ENSC website and the literature also contributed to program awareness, as 25 percent of participants learned about the program through those two components. Econoler found the ENSC website to be an excellent communication tool for the program.

Word of mouth was also mentioned as an important source of awareness, which should be considered as a strong indicator of program satisfaction.

## **Satisfaction**

Satisfaction towards the program is high among participants. Indeed, most participants expressed their satisfaction with the overall program and its various aspects. Considering the participants' high level of satisfaction towards the program and its prescriptive nature, it is not surprising that most participants did not face any barriers during their involvement in the program.

Participants surveyed through the 2011 evaluation mentioned recommendations to improve the program that mainly relied on communication improvements: more information or information sessions, better marketing, more contact between customers and program staff. Furthermore, in order to fulfill the most important motivation for participating in the BER program and for installing energy-efficient equipment, program activities and documentation should continue to focus on energy savings and cost reduction.

## **Program Energy Savings**

To calculate the net savings of the BER program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from the on-site visits and included interactive effects for lighting products. Moreover, Econoler took into consideration the free-ridership and internal spillover measured as part of the participant survey. Through this approach, a free-ridership level of 17.6 percent was captured, while a spillover level of 0.2 percent was identified.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 17.6%       |
| Spillover Level      | 0.2%        |
| Net-to-Gross Ratio   | 0.83        |

The evaluation revealed that the BER program had generated net energy savings of 7.002 GWh and demand savings of 1.419 MW at the generator in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Installed Gross Savings</b> | <b>Installed Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------------------------|---------------------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 9.483 GWh                    | 9.483 GWh                      | 9.483 GWh                                               | 0.75        | 7.112 GWh          |
| <b>Evaluation Results</b> | <b>9.760 GWh</b>             | <b>9.340 GWh</b>               | <b>8.436 GWh</b>                                        | <b>0.83</b> | <b>7.002 GWh</b>   |
| <b>Demand Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 1.977 MW                     | 1.977 MW                       | 1.977 MW                                                | 0.75        | 1.483 MW           |
| <b>Evaluation Results</b> | <b>1.963 MW</b>              | <b>1.895 MW</b>                | <b>1.710 MW</b>                                         | <b>0.83</b> | <b>1.419 MW</b>    |

The net evaluated savings were slightly lower than those tracked by ENSC for 2011. This can be explained by adjustments calculated from on-site visits and applied to the tracked gross savings, and by the interactive effects factor of -7.7 percent applied to the savings for lighting products installed in non-refrigerated spaces. The NTGR used for the evaluation was higher than the one used for tracked savings. However, this increase was not sufficient to overcome the reduction in energy savings resulting from the adjustments.



## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following specific recommendations that are aimed at optimizing specific aspects of the program:

- BER-R1. Improve the tracking sheet to allow for a better validation of savings:** Currently, all the calculation values in the tracking sheet are contained in one cell, not allowing for a systematic validation of the savings for each measure. Breaking down the values used for savings calculations would allow the Evaluator to validate the savings calculations for each measure in the database instead of using adjustment ratios. Furthermore, most categories of measures include several sub-categories. The savings calculations approach is often very different from one sub-category to the other. Including the sub-category of the measure in the tracking sheet would allow selecting the most appropriate approach and baseline values to calculate savings during the evaluation process.
- BER-R2. Inform participants about expected customer savings:** Once the final rebate is disbursed to clients, Econoler recommends informing them about the approximate savings to be expected from the project, in terms of energy and money. This would be an easy way to communicate energy savings and cost reductions, which constitutes the most important motivation for participating in the BER program and for installing energy-efficient equipment.
- BER-R3. Increase program promotion:** The fact that the ENSC website, the literature, the staff and the presentation were mentioned as source of program awareness is a positive result showing that ENSC actions contribute to program knowledge. However, evaluation results indicate that there could be additional effort in program promotion and communication. This could be assessed by having more contact people, giving information sessions such as lunch and learns as well as by advertising through other websites and organizations.
- BER-R4. Require additional information from participants to better calculate savings:** Additional information would be necessary for some measures in order to estimate savings more accurately. For HVAC equipment, the use of full load hours for calculating savings should be validated with participants. For refrigeration units, temperature and hours of usage should be collected. For occupancy sensors, information on the usage period should be collected to calculate the impact on peak demand. Finally, for all lighting participants, information on the heating source and the use of air conditioning should be collected during the surveys with C&I customers to better estimate the interactive effects.

- BER-R5. Increase the number of on-site visits to include an acceptable quantity of projects for each category of equipment installed through the program:** Several on-site visits are required to properly assess adjustments to energy and demand savings for each category of equipment. For the current evaluation, since the population was limited at the time of site selection, a single on-site visit was conducted for some categories, not allowing for adjustment values to be established for all measures in these categories. For the next evaluation, it is necessary to make sure that all known categories of equipment are covered with sufficient on-site visits to validate savings for each category.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Business Energy Rebates (BER) program provides financial incentives, in the form of prescriptive rebates, to commercial and industrial (C&I) clients to reduce electrical energy consumption and demand. The BER program, launched on June 28, 2010, was modeled closely after successful prescriptive programs offered by other demand-side management (DSM) administrators, in particular Efficiency Vermont (EVT).

All commercial and industrial customers in Nova Scotia are eligible. This includes the following facilities:

- > commercial or industrial facilities served directly or indirectly by Nova Scotia Power (NSPI);
- > multi-unit residential building common areas (if apartment units are individually metered on residential accounts) or for the entire facility (if all units are metered together under one or more commercial accounts);
- > new facilities in the design or construction phase.

### **Program Objectives**

The goals of this program are to:

- > raise customer awareness of efficient products options;
- > encourage the use of efficient products in the design of new facilities and retrofits;
- > increase the market penetration of supported technologies;
- > eventually transform the market by raising the efficiency of standard practices.

The program aimed to achieve net electricity savings of 21.80 GWh in 2011. In 2010, the BER program generated net electricity savings of 0.503 GWh.

### **Eligible Measures**

The prescribed measures are divided into seven categories:

- > Lighting Fixtures & Lamps;
- > Occupancy Sensors;
- > Motors & Variable-Speed Drives (VSDs);
- > Commercial Central Heating & Cooling (HVAC) systems;
- > Commercial Laundry Equipment;
- > Refrigeration Equipment; and
- > Compressed Air Equipment.

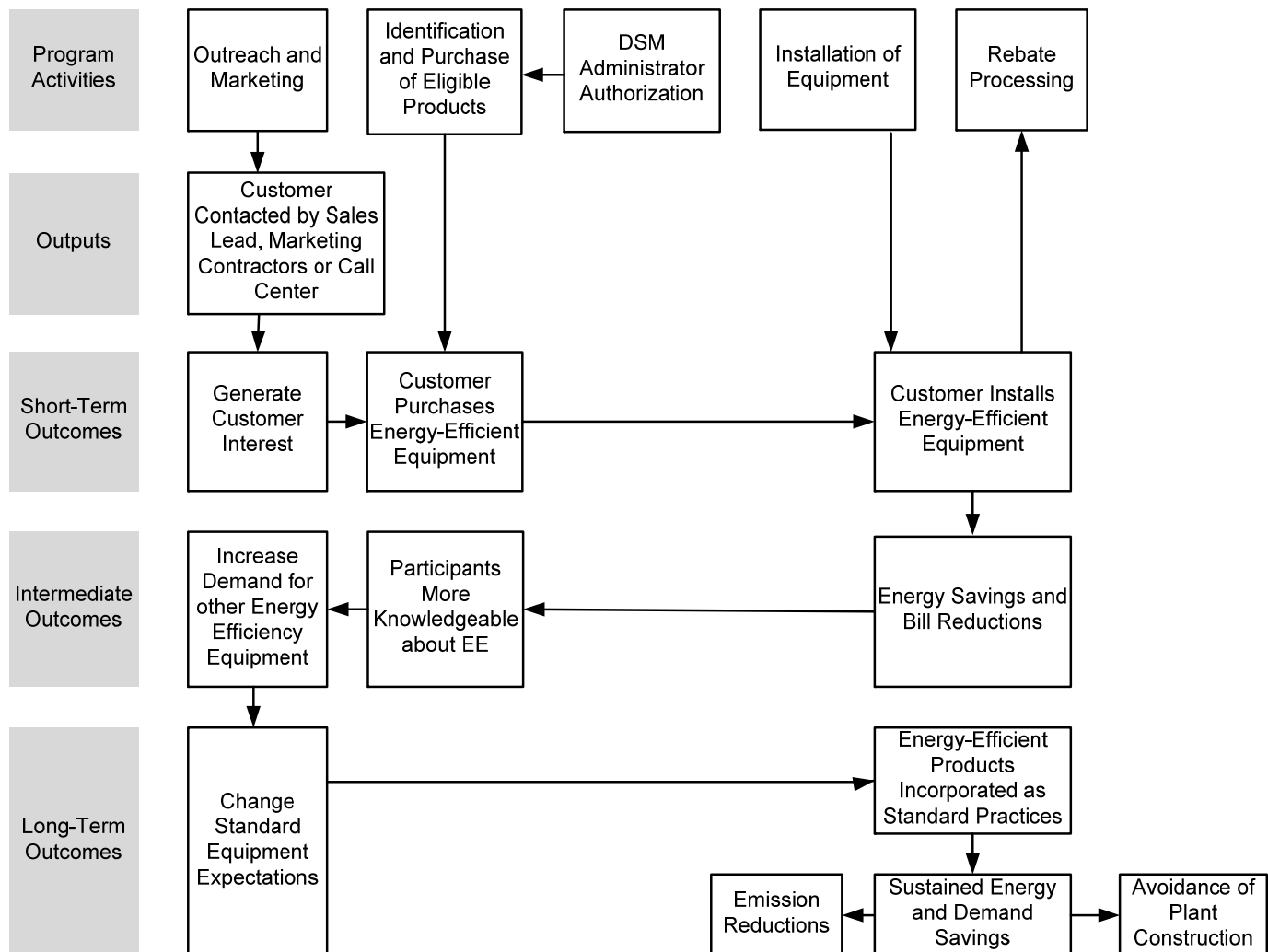
Eligible products are established for each measure category by applying specific criteria based on industry standards such as ENERGY STAR® and the National Electrical Manufacturers Association (NEMA), and on minimum efficiency/efficacy values.

To facilitate customer participation, a list of already-approved products is available. It is to be noted that eligible products are not limited to this list, which ensures that products designed by any manufacturer can be implemented through the program, provided they meet the specified criteria for that measure category.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Business Energy Rebates Program Logic Model**

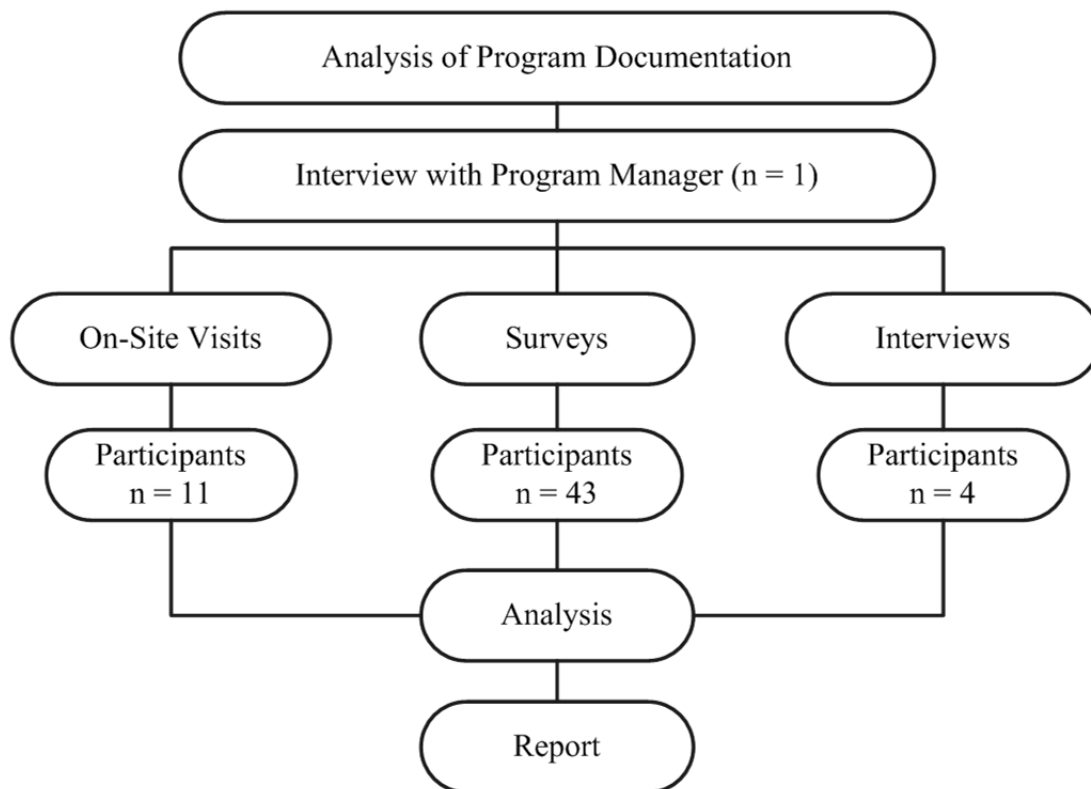


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guide and the survey questionnaire are included in Appendices III, IV and V.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the BER program was the analysis of the program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was obtained primarily from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

### **2.2.3 On-Site Visits**

In October and November, 11 on-site visits were conducted at facilities where BER measures had been implemented. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These site visits were used to validate measure implementation (number or measures implemented and type of technology) in accordance with the data found in the tracking sheet as well as hours of operation through an interview with the energy manager, site owner or maintenance supervisor of each site selected. Moreover, existing (baseline) equipment characteristics (number, wattage, HP, etc.) were validated during the visits, whenever possible.

The methodology used for the on-site visits for the BER program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VI.

### **2.2.4 Participant Survey**

A telephone survey with a total of 43 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 18 minutes.

The participant survey was used to understand the following:

- > previous program participation;
- > how participants learned about the program;
- > participant motivations and barriers;
- > spillover and free-ridership;
- > energy attitudes; and
- > satisfaction with the program.

The profile of the organizations interviewed through the survey is featured in Appendix II.

The table below shows the population and sample size, as well as the associated sampling error at the 90 percent confidence level for the 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population       | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|------------------|-----------------|-------------------------------------------|
| 2010 Participants | 30 <sup>1</sup>  | 11              | ±20.1%                                    |
| 2011 Participants | 106 <sup>2</sup> | 43              | ±9.7%                                     |

## 2.2.5 In-Depth Interviews with Participants

In December, four in-depth interviews were conducted with participants of the BER program. The participants contacted for these interviews were flagged for spillover during the telephone survey. These in-depth interviews were used as follow-up calls to validate certain information in the application form. The hours of operation and the characteristics of the equipment installed were validated. Moreover, the interviews were used to obtain a better insight into the participants' experience with the program and to confirm additional purchases of energy-efficient products reported by participants during the telephone survey.

The questions used for the in-depth interviews are presented in Appendix IV.

<sup>1</sup> The sample for the 2010 survey was 30 participants. The BER program launched in 2010 had relatively few participants (13) at the end of the 2010 program year. Thus, ENSC's previous Evaluator included 17 participants whose projects had not been completed as of the end of 2010. These 17 participants may have been surveyed in 2010 as well as in 2011.

<sup>2</sup> The population for the 2011 survey was 52 participants at the time of conducting the survey.

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted on the BER program focuses on ENSC's objective, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

This process evaluation was performed through interviews with the PM and through telephone surveys with program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The BER program manual contains a series of components for internal use by program staff. The program manual is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some standard components are usually included in program manuals intended for internal use. The table below presents such information as well as what is presented in the BER manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | BER Program Manual |
|--------------------------------------------------------------------------------------------------------------|--------------------|
| Document revisions                                                                                           | ✓                  |
| Program description (including nature or type of program)                                                    | ✓                  |
| Program justification                                                                                        | ⚠                  |
| Program objectives                                                                                           | ✓                  |
| Incentives                                                                                                   | ✓                  |
| Eligibility criteria                                                                                         | ✓                  |
| Program partners and their roles                                                                             | Not Applicable     |
| Program barriers                                                                                             | ✓                  |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ✓                  |
| Details about the savings calculations and type of measures                                                  | ✓                  |
| Budget per year                                                                                              | ✓                  |
| Cost-effectiveness test results                                                                              | ✓                  |



| Program Manual Content                                                                                                                                                                                                                                                                                                                                                     | BER Program Manual                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                              |  |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                             |  |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                            |  |
| Program theory                                                                                                                                                                                                                                                                                                                                                             |  |
| Logic model                                                                                                                                                                                                                                                                                                                                                                |  |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                 |  |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                  |  |
| Program forms                                                                                                                                                                                                                                                                                                                                                              |  |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                                                                                     |

Econoler has analyzed the program manual. It contains a lot of relevant information useful for both the PM and the Evaluator. However, the program manual needs to be streamlined since there are several repetitions. An effort to reduce its content is underway and Econoler strongly supports this initiative. The following are recommendations to improve the BER program manual:

> **Document important program assumptions or practices:**

- The Evaluator understands that the measures included in the program as well as the gross savings they generate are based on a similar program run by EVT. Regardless, the program manual should incorporate all details from EVT on each measure and the savings assumptions for program memory purposes.
- The rationale behind the incentives calculation seems adequate based on possible yields from market transformation and the level of participation. Furthermore, the incentives calculation was designed to cover from 20 to 40 percent of material costs, which represent the incremental cost as well as early replacement costs in some cases. The Evaluator recommends including this important information in the program manual since costs fluctuate over time and rebates will have to be adjusted frequently.
- The program manual should document the criteria for selecting projects that will be inspected.
- The scoring mechanism to calculate the free-ridership percentage from the three questions included in the application form should be documented in the program manual.

- > **Provide the parameters used to estimate program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PA and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
- > **Refine and disseminate the marketing plans:** Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written but important information that would serve as “program memory” in case of modifications or staff changes is missing. The program manual content should be updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of the BER program tracking sheet. It is to be noted that the Evaluator did not review the general data management system (online database). However, for certain projects, online documents were consulted to obtain and validate details on the measures installed, such as the number or type of product and the hours of operation.

In general, the tracking sheet is useful to the PM and provides ENSC with a way to monitor program activities. All fields essential to program administration are present, even though some of them are missing values. However, the tracking sheet structure limits the evaluation process and savings tracking since the PM cannot identify the exact measure implemented based on the information available. Even if energy and demand savings are present for each measure, the values used to calculate the savings are in a format that does not allow for a systematic validation of the calculation. Moreover, the characteristics of the old and new equipment are not clearly indicated in the tracking sheet, which complicates the evaluation process and makes savings revision difficult. Several improvements are recommended to make this tool a better asset for the PM and the Evaluator. Those will be detailed at the end of this section.

The tracking sheet presents information in two separate sheets: one lists participant information and the other lists measure details. Each project has a unique identification number which links the participant information with the details for the different measures implemented for that project. Only projects that are completed are listed in the tracking sheet. The measure detail sheet presents the general category of the measures installed as well as the demand and energy savings values estimated by the PM. Moreover, that sheet details the calculation used to obtain the savings.

The participant information necessary to conduct the field activities (surveys and on-site visits) was listed in the tracking sheet. However, some fields in the measure sheet are not always filled in. This information might not be essential for program administration but would be useful for its evaluation. For measure information, details on the type of measure are missing for all projects. The absence of these details prevents the validation of savings based only on the information available in the tracking sheet. Moreover, all the values used for savings calculations are combined in one cell, in the form of a savings equation. Those values include the number of old and new equipment and their characteristics, as well as the hours of operation and the default parameters required for savings calculations. As it is featured now, the information in that cell does not allow the Evaluator to systematically validate the savings calculations by reproducing that calculation.

The number of products, their characteristics (capacity or wattage) and the hours of operation for the old and new equipment are filled in by the PM, based on the information provided by the participant. In some cases, standard values are used by the PM when the details for the old equipment are not available or when the savings calculation methodology requires their use, which is the case for some refrigeration measures.

For most measures, the savings calculations are based on methodologies developed by Efficiency Vermont<sup>3</sup> for their energy efficiency programs. For occupancy sensors, the savings for each type of facility are based on a study conducted by the US-EPA and the Lighting Research Center of the School of Architecture – Rensselaer Polytechnic Institute<sup>4</sup>.

It should be noted that the PM is satisfied with the tracking sheet and considers the tracking sheet easy to use.

In conclusion, several adjustments should be made to allow the validation of the savings calculations and improve tracking sheet consistency as well as program evaluation. The Evaluator recommends that ENSC:

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<sup>3</sup> Efficiency Vermont, Technical Reference User Manual (TRM): *Measure Savings Algorithms and Cost Assumptions* (December 2008).

<sup>4</sup> US-EPA and the Lighting Research Center of the School of Architecture – Rensselaer Polytechnic Institute (Bill VonNeida, Dorene Maniccia, Allan Tweed), *An analysis of the energy and cost savings potential of occupancy sensors for commercial lighting systems* (August 2000).

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- > **Break down the values used for savings calculations in different cells:** This will allow the Evaluator to validate the savings calculations for each measure in the database. Currently, all the values are contained in one cell, not allowing for a systematic validation of the savings for each measure. A simple reorganization of the database would make this operation possible. The number of products as well as characteristics such as wattage, horse-power (HP) and seasonal energy efficiency ratio (SEER) should each be contained in their own cell. However, considering the multitude of approaches used to calculate the energy savings for this program, it is useful to keep the detailed equation in the tracking sheet, as the savings calculation parameters can vary from one project to another.
  - > **Include measure sub-categories for categories with several measures:** Most categories of measures include several sub-categories. This is the case for Compressed Air, HVAC, Lighting, Motors and Drives and Refrigeration. The savings calculation approach is often very different from one sub-category to the other. Moreover, baseline values are established based on the measure sub-category. Including the sub-category of the measure in the database would allow the selection of the appropriate approach and baseline values to calculate savings during the evaluation process.
  - > **Break down the address information:** Currently, the address information for each participant is contained in one cell. This complicates site selection based on location for field activities. Presenting the address information in three cells – street address, city and postal code – will greatly facilitate this process.
  - > **Ensure that all fields are systematically filled in:** It is recommended that the PM ensure that all tracking sheet fields are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet. At the time of the analysis for the 2011 tracking sheet, the fields listed below presented several missing values:
    - postal code used as part of the client's address – this field was empty for more than 10 percent of the records;
    - bill account number used to match participant finance and consent forms – this field was empty for almost 50 percent of the records. However, that information is available in the online database for each project and should also be in each project paper file. The tracking should then be updated to reflect that fact.

For future evaluations, some of these elements will be useful for field activities and facilitate the savings validation.
  - > **Standardize the entries:** To prevent the same information from being entered in different ways in the tracking sheet, ENSC should integrate a drop-down list of answers when possible. For instance, in the 2011 tracking, the Motors and Drives category is identified in three different ways. This will facilitate the site sampling process and the savings validation once a systematic validation can be conducted.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

Following the analysis of all program elements, and with the most up-to-date information about the program background and tools, the Evaluator concludes that the program is well designed and has a good potential of success. Overall, the program totalled 106 participants, which is a substantial increase in the number of participants compared with last year (13 participants), when the program was in its first year. The program implemented great practices such as accepting only measures that had not been installed before requesting the incentive or submitting large projects for pre-approval. In 2011, the program was upgraded in several aspects. Notably, in order to increase participation, the PM held several meetings with sales representatives for each type of measure fostered by the program so that they could be more proactive in promoting the program (market push). Moreover, ENSC merged all five application forms for each measure category into a single model, which in turn eased the participant application process. The new application form includes questions designed to screen free-riders. A participant process flow chart was also developed by ENSC in order to make the program participation procedures clearer. However, Econoler has the following recommendations regarding program design and delivery:

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific topics important to the PA are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Monitor the delay to process the application:** The 30-day delay to process the application and receive the incentive should be monitored to ensure that it is respected and avoid any complaints regarding delays.
- > **Inform participants about expected customer savings:** Once the final rebate is disbursed to clients, Econoler recommends informing them about the approximate savings in terms of energy and money to be expected from the project, which will represent an added value to the customer.

### 3.5 ENSC WEBSITE

Customers can consult the ENSC website to find a large amount of information regarding the program, such as a list of rebates and eligibility criteria for the five categories of measures. Econoler finds the program brochure available on the website to be very clear and complete with advice such as contacting the PM to ensure the product is eligible for a rebate, especially since the approved product list is frequently updated. Econoler recommends including a revision date on the application form available on the website for better tracking and referencing.

### 3.6 PARTICIPANT PERSPECTIVES

This section shows the results of the telephone survey conducted with a total of 43 program participants. The results of the 2010 survey are also presented when possible<sup>5</sup>.

#### 3.6.1 Previous Program Participation

Two in 10 participants report participating in another program prior to the BER program (21%). Three of these organizations participated in the Small Business Lighting Solutions program (now called Small Business Energy Solutions), while three participated in the Commercial and Industrial Custom program.

**Table 5: Previous Program Participation**

| <b>Other Program Participation</b>       | <b>2011 (%)</b> |
|------------------------------------------|-----------------|
| <i>Sample Size</i>                       | 43              |
| Yes                                      | 21%             |
| No                                       | 65%             |
| Don't know/no answer                     | 14%             |
| <b>Program Participation</b>             | <b>2011 (#)</b> |
| <i>Sample Size</i>                       | 9               |
| Lighting Solutions                       | 3               |
| Commercial and Industrial Custom program | 3               |
| Other                                    | 3               |

<sup>5</sup> 2010 results are presented as frequencies (#) since the number of respondents is very low, whereas most 2011 results are presented as percentages (%).

### 3.6.2 Program Awareness

The most common way organizations heard about the BER program was through contractors or vendors (60%), followed by word of mouth through a business associate or friend (53%). Approximately three in 10 first heard about the program from a previous participant (30%), ENSC literature (26%) or the ENSC website (26%). The high level of word of mouth (friend, business associate, previous participants) is a strong indicator of program satisfaction. The results also indicate that ENSC's actions contribute to program knowledge (literature, website, staff and presentation).

**Table 6: Source of BER Program Awareness**

| Source                                  | 2010 (#)  | 2011* (%) |
|-----------------------------------------|-----------|-----------|
| <i>Sample Size</i>                      | <i>11</i> | <i>43</i> |
| Contractor or vendor                    | 3         | 60%       |
| Business associate/friend/word of mouth | --        | 53%       |
| Previous participant                    | 1         | 30%       |
| ENSC literature                         | 1         | 26%       |
| ENSC website                            | --        | 26%       |
| ENSC staff                              | 2         | 14%       |
| ENSC presentation                       | 1         | 7%        |
| Trade newsletter (email)                | 1         | --        |
| Other                                   | 1         | --        |
| Don't know                              | 1         | --        |
| *Multiple mentions                      |           |           |

### 3.6.3 Participant Motivations and Barriers

The most important reasons for participating in the BER program are to save on energy costs (44%) and take advantage of program rebates (33%).

**Table 7: Reasons for Participating**

| Motivations                                   | 2010 (#)                  |                                  | 2011 (%)                  |                                  |
|-----------------------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|
|                                               | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation |
| <i>Sample Size</i>                            | <i>11</i>                 | <i>11</i>                        | <i>43</i>                 | <i>43</i>                        |
| Save on energy costs/bills                    | 6                         | 3                                | 44%                       | 21%                              |
| Take advantage of program incentives/ rebates | --                        | 3                                | 33%                       | 26%                              |
| Improve existing lighting conditions          | --                        | 2                                | 7%                        | 7%                               |
| Quality of efficiency products                | --                        | --                               | 5%                        | 2%                               |
| Environment                                   | 1                         | 1                                | 2%                        | 9%                               |
| Reduce maintenance costs                      | --                        | --                               | 2%                        | 7%                               |
| Recommended by contractor                     | --                        | --                               | 2%                        | --                               |
| Update equipment                              | --                        | --                               | --                        | 7%                               |
| Already planning project                      | 1                         | --                               | --                        | --                               |
| Find ways to reduce carbon footprint          | --                        | --                               | --                        | 5%                               |
| Easy process                                  | 1                         | 1                                | --                        | --                               |
| Energy conservation                           | 1                         | --                               | --                        | --                               |
| Already pay into the program                  | 1                         | --                               | --                        | --                               |
| Other                                         | --                        | --                               | 5%                        | 5%                               |
| Don't know                                    | --                        | 1                                | --                        | 12%                              |



Respondents were asked their motivations for installing energy-efficient equipment. Among those who had implemented lighting measures (n = 34), savings on energy costs was the most important motivation (65%), followed by improving existing lighting conditions (15%). Among the four respondents who had installed new motors or VSDs, two had primarily done so to save on energy costs, and one to take advantage of rebates. In terms of organizations that had installed HVAC equipment (n = 3), one had done so to save on energy costs, one to reduce its carbon footprint and one because of old equipment. For the one organization that had implemented compressed air or refrigeration measures, saving on energy costs was the most important motivation. Combining responses for all measures clearly indicates that saving on energy costs is the most important motivation (84%), while improving lighting conditions (26%) and taking advantage of rebates are also important (26%), but to a lesser extent.

Since survey results indicate that saving on energy costs is the most important motivation for installing energy-efficient equipment and for participating in the BER program, program activities and documentation should continue to focus on energy bill savings.

**Table 8: Importance of Motivations for Product Installation**

| Motivations                                              | 2011        |                 |                    |                 |                         |                 |                |                 |               |                 |              |                 |
|----------------------------------------------------------|-------------|-----------------|--------------------|-----------------|-------------------------|-----------------|----------------|-----------------|---------------|-----------------|--------------|-----------------|
|                                                          | Lighting    |                 | New Motors or VSDs |                 | HVAC Equipment/Upgrades |                 | Compressed Air |                 | Refrigerators |                 | All Measures |                 |
|                                                          | Most Imp. % | 2nd Most Imp. % | Most Imp. #        | 2nd Most Imp. # | Most Imp. #             | 2nd Most Imp. # | Most Imp. #    | 2nd Most Imp. # | Most Imp. #   | 2nd Most Imp. # | Most Imp. %  | 2nd Most Imp. % |
| Sample Size                                              | 34          | 34              | 4                  | 4               | 3                       | 3               | 2              | 2               | 1             | 1               | 43           | 43              |
| Save on energy costs/bills                               | 65%         | 24%             | 2                  | 1               | 1                       | --              | 1              | 1               | 1             | --              | 84%          | 36%             |
| Improve existing lighting conditions                     | 15%         | 18%             | --                 | --              | --                      | --              | --             | --              | --            | --              | 26%          | 11%             |
| Take advantage of program incentives/rebates             | 3%          | 21%             | 1                  | 1               | --                      | 1               | --             | --              | --            | --              | 26%          | 11%             |
| Help protect the environment/the environment/to be green | 3%          | 12%             | --                 | --              | --                      | --              | --             | --              | --            | --              | 12%          | 5%              |
| Reduce maintenance costs                                 | 3%          | 9%              | --                 | --              | --                      | --              | --             | --              | --            | --              | 9%           | 4%              |
| Reduce carbon footprint                                  | --          | 6%              | --                 | --              | 1                       | --              | --             | --              | --            | --              | 7%           | 3%              |
| Old equipment, replace prior to failure                  | --          | 3%              | --                 | 1               | 1                       | --              | --             | --              | --            | 1               | 9%           | 4%              |
| Part of building renovation or addition                  | --          | --              | --                 | --              | --                      | 1               | --             | --              | --            | --              | 2%           | 1%              |
| Other                                                    | 12%         | 3%              | 1                  | --              | --                      | 1               | 1              | 1               | --            | --              | 19%          | 8%              |
| Don't know/refused                                       | --          | 6%              | --                 | 1               | --                      | --              | --             | --              | --            | --              | 7%           | 3%              |

When asked who was responsible for specifying the measures to be implemented through the BER program, one-third of respondents mentioned someone within their organization (35%). Three in 10 stated a representative from the manufacturer (30%) specified the measures and a similar number stated a contractor (28%) did.

This result, combined with the fact that the first source of program awareness was contractors or vendors, highlights the importance of contractors in program promotion.

**Table 9: Individual Responsible for Specifying Measures Implemented through the BER Program**

| Main Responsible                    | 2011 (%)  |
|-------------------------------------|-----------|
| <i>Sample Size</i>                  | <i>43</i> |
| Someone within company/organization | 35%       |
| Manufacturer representative         | 30%       |
| Contractor                          | 28%       |
| Utility account manager             | 2%        |
| Outside design professional         | 2%        |
| Other                               | 2%        |

Most participants did not face any barriers during program participation (88%), with just nine percent of respondents stating that they had faced barriers. From the four respondents who had faced barriers, one participant mentioned a lack of information to make an informed decision and one participant stated that the products installed were not eligible for the program.

**Table 10: Barriers Faced During Program Participation**

| Faced Barrier(s)   | 2010 (#)  | 2011 (%)  |
|--------------------|-----------|-----------|
| <i>Sample Size</i> | <i>11</i> | <i>43</i> |
| No                 | 10        | 88%       |
| Yes                | 1         | 9%        |
| Don't know         | --        | 2%        |

### 3.6.4 Energy Attitudes

Nearly all respondents believe reducing energy usage (98%) and managing energy costs (93%) are important to their organization.

**Table 11: Importance of Energy Management**

| Importance of...*                                                                                   | 2010 (#) | 2011 (%) |
|-----------------------------------------------------------------------------------------------------|----------|----------|
| <i>Sample Size</i>                                                                                  | 11       | 43       |
| Reducing energy usage                                                                               | 11       | 98%      |
| Managing energy costs                                                                               | 11       | 93%      |
| *Those giving a rating of 5 or 4 on a scale where 5= 'very important' and 1= 'not at all important' |          |          |

All respondents are likely to purchase energy-efficient products when installing or replacing products in the future, which is similar to 2010 results.

**Table 12: Likelihood of Purchasing Energy-Efficient Products in the Future**

| Likelihood of Energy-Efficient Upgrades when Replacing Equipment in the Future | Sample Size | Rating: 5= "very likely" and 1 = "not at all likely" |     |    |    |    |
|--------------------------------------------------------------------------------|-------------|------------------------------------------------------|-----|----|----|----|
|                                                                                |             | 5                                                    | 4   | 3  | 2  | 1  |
| 2010 (#)                                                                       | 11          | 8                                                    | 2   | 1  | -- | -- |
| 2011 (%)                                                                       | 43          | 74%                                                  | 26% | -- | -- | -- |

These results show a very positive attitude and a high level of motivation toward energy efficiency among participants. However, survey results indicate that the majority of participants had not participated in another program prior to the BER program and did not purchase eligible energy-efficient products following their participation in the BER program (internal spillover, see Section 4.4.2 for more details). This could be a mere timing issue since their participation was fairly recent. However, ENSC could still promote additional actions to participants by providing information on its other programs.

### 3.6.5 Program Influence

Respondents were asked to rate the influence of specific elements on their decision to implement energy efficiency measures through the BER program. The results show that ENSC's rebates had the greatest influence on the decision (mean of 7.3 on an importance scale from 0 to 10). The information received during the initial contact was also deemed important by program participants (mean of 6.4).

**Table 13: Influence of Program Elements on BER Participation**

| <b>Program Element</b><br><b>0 is "not at all important," 10 is "extremely important"</b> | <b>2011<br/>Mean Score</b> |
|-------------------------------------------------------------------------------------------|----------------------------|
| <i>Sample Size</i>                                                                        | <i>43</i>                  |
| ENSC rebates                                                                              | 7.3                        |
| Information received during initial contact                                               | 6.4                        |
| Organization's corporate policy or guidelines regarding the purchase of equipment         | 5.4                        |
| Standard practice in industry                                                             | 5.4                        |
| Information provided through program outreach and marketing activities                    | 5.1                        |
| Previous experience with program or similar program                                       | 4.3                        |

### 3.6.6 Program Satisfaction and Improvement Suggestions

Program participants are highly satisfied with the BER program. Indeed, nine in 10 participants (91%) offered a rating of 5 or 4 on a 5-point scale when assessing the overall program, where 5 is “very satisfied” and 1 is “not at all satisfied.”

Respondents were asked to rate various elements of the program. Most areas received high satisfaction ratings; indeed, a majority of respondents offered a rating of 5 or 4 in terms of interactions and communication with staff (87%), availability of staff (87%), initial confirmation of eligibility (86%) as well as program application, forms or paperwork (85%). The two components that received lower rates, although somewhat positive, are related to the discounts offered. Overall, it is commonplace that these elements (rebate amount or time required to receive amount) be perceived more negatively by participants from similar programs. Be that as it may, the results obtained by ENSC are rather positive.

**Table 14: Satisfaction with BER Program**

| Aspect of Program*                                                                                  | n** | 2010 (#) | n** | 2011 (%) |
|-----------------------------------------------------------------------------------------------------|-----|----------|-----|----------|
| Program overall                                                                                     | 11  | 8        | 42  | 91%      |
| Interactions and communication with staff                                                           | 9   | 7        | 38  | 87%      |
| Availability of ENSC staff                                                                          | 10  | 8        | 38  | 87%      |
| Initial confirmation of eligibility                                                                 | 11  | 6        | 42  | 86%      |
| Program application, forms and paperwork                                                            | 11  | 6        | 40  | 85%      |
| Time required to receive rebate or incentive                                                        | 11  | 7        | 41  | 83%      |
| Rebate or incentive amounts                                                                         | 11  | 5        | 43  | 79%      |
| *Those giving a rating of 5 or 4 on a scale where 5= ‘very satisfied’ and 1= ‘not at all satisfied’ |     |          |     |          |
| ** Don’t know/refused removed from calculations                                                     |     |          |     |          |

In terms of suggestions for improving the BER program, a small number of respondents would like more information or information sessions (14%), better marketing of the program (12%) or better communication between customers and program staff (9%).

More specifically, analysis of respondents' answers suggests that improvements could be made to increase interactions with businesses; e.g., by having more contact people, doing cold calls as well as by organizing lunches and information sessions. Interactions and communication with program staff could also be improved as some respondents said that it was sometimes difficult to get a hold of the program representative. However, it should be kept in mind that satisfaction towards interactions and communication with program staff is high among participants (87% as presented in the previous table).

To improve program awareness, some respondents also suggested advertising the program through other websites such as the Nova Scotia Federation of Agriculture website and the Dairy Farmers of Nova Scotia website. One respondent explained his situation as follows: *"I only learned about this program from the Department of Agriculture, so they need to have more public awareness. I'm a farmer and a lot of time we go under the radar because on our meter we are classified as residential. They should make it more known to the farming community."*

Noteworthy is that one respondent recommended using electronic forms on the ENSC website: *"I had to print them off and fill it in by hand instead of by keyboard so I guess a form where I could fill it in on my computer would be my suggestion."*

**Table 15: Recommendations to Improve Program**

| <b>Suggestions to Improve the BER Program</b>                                                   | <b>2010 (#)</b> | <b>2011 (%)</b> |
|-------------------------------------------------------------------------------------------------|-----------------|-----------------|
| <i>Sample Size</i>                                                                              | <i>11</i>       | <i>43</i>       |
| Provide more information/information sessions                                                   | --              | 14%             |
| Better marketing/awareness                                                                      | --              | 12%             |
| More direct contact between customer and program staff/more contact people/better communication | 1               | 9%              |
| Increase/better rebates                                                                         | 3               | 7%              |
| Keep focus on retrofits                                                                         | 1               | --              |
| Clarify which products are eligible for rebates                                                 | 1               | --              |
| Make forms more user-friendly                                                                   | 1               | 2%              |
| Other                                                                                           | --              | 14%             |
| None                                                                                            | 4               | --              |
| Don't know/no answer                                                                            | --              | 51%             |

A combined six in 10 respondents (58%) feel that a diagram illustrating the various steps to follow in order to participate in the BER program would have facilitated their participation in the program.

This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 16: Provision of a Diagram Illustrating Steps of BER Program**

| <b>Diagram Illustrating Steps of BER Program Would have Facilitated Participation</b> | <b>2011 (%)</b> |
|---------------------------------------------------------------------------------------|-----------------|
| <i>Sample Size</i>                                                                    | <i>43</i>       |
| Significantly                                                                         | 16%             |
| Somewhat                                                                              | 42%             |
| Slightly                                                                              | 12%             |
| Not at all                                                                            | 16%             |
| Depends on the figure or illustration                                                 | 2%              |
| Don't know                                                                            | 12%             |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > savings calculation methodology for each type of measure;
- > hours of operation;
- > installation rate;
- > diversity factor;
- > interactive effects;
- > free-ridership; and
- > internal spillover.

The impact evaluation was based on a review of the program tracking sheet, 11 on-site visits and 43 participant surveys. Moreover, four participant in-depth interviews were conducted.

The review of the program tracking sheet included an analysis of the methodology used to calculate savings for the different types of eligible measures.

As recommended in the Savings Verification Study relative to the 2010 DSM programs, on-site visits were performed for each sub-category of measures, except when savings in a sub-category were deemed too low to require a site visit. On-site visits were used to verify the technology installed in participant facilities, as well as to collect information on hours of operation from the site contact. Information on the space heating source and HVAC equipment was also obtained during on-site visits when required. The detailed participant interviews were used to confirm operational and equipment information present in the tracking sheet.

The data collected during these two activities was used to establish installation rates, hours of operation and interactive effects affecting program demand and energy savings. All of these activities were used to establish an adjustment ratio for the gross energy savings calculated in the tracking sheet.

The participant surveys provided information to calculate the net-to-gross ratio (NTGR) for this program, including free-ridership and internal spillover. The NTGR established was used to calculate the program net savings.



#### 4.1.1 On-Site Visit Sampling and Protocol

##### Sampling Methodology

The sampling was established from the tracking sheet project list. The tracking sheet for 2011 contains 130 projects. These 130 projects were implemented by 106 participants and covered different measures. Table 17 presents the weight in terms of savings for each category for all the projects completed in 2011.

In order to ensure that the on-site visits covered all the significant measure categories present in the database, a minimum quota of one on-site visit for each measure category was set for the selection of the sample. Sampling was conducted using data on completed projects as of August 2011. At the time of the sampling, the compressed air and refrigeration categories each represented less than 0.3 percent of total savings, compared to 3 percent and 26.2 percent respectively for the whole year, as presented in Table 17. Considering that only 11 on-site visits were planned, it was decided that an on-site visit was not necessary to validate the savings from these categories since their impact on total savings was expected to be minimal. Moreover, at the time of the sampling, no site had implemented laundry measures resulting in no on-site visit being planned for this category. One site had implemented both lighting and refrigeration measures and was retained in the sample as it allowed validation of the energy savings from refrigeration and lighting measures simultaneously.

The lighting category featured the largest savings, with almost 60 percent of total savings. Thus, the remaining seven sites to be sampled, after the selection based on technology, were allocated to lighting measures, for a total of eight on-site visits for this category.

**Table 17: Energy Savings per Category for 2011**

|                            | Compressed Air | HVAC   | Laundry | Lighting | Motors & Drives | Occupancy Sensor | Refrigeration | Total   |
|----------------------------|----------------|--------|---------|----------|-----------------|------------------|---------------|---------|
| Total Energy Savings (MWh) | 266.8          | 328.4  | 0.5     | 5,597.4  | 142.6           | 176.1            | 2,317.4       | 8,829.2 |
| % of Total Savings         | 3.021%         | 3.720% | 0.005%  | 63.397%  | 1.615%          | 1.995%           | 26.247%       | 100.00% |

A list of preferable regions, close to major city centres, was established for site visit selection. The following areas were considered:

- > Halifax;
- > Dartmouth;
- > Sydney and North Sydney;
- > Coldbrook and Kentville; and
- > Pictou County.

For lighting measures, energy savings varied from 336 kWh to 1,087,932 kWh per site. In order to include both sites with significant energy savings and sites with lower energy savings in the sample, two strata of projects were established: sites with savings up to 100,000 kWh and sites with savings above 100,000 kWh. At the time of the sampling, sites with energy savings above 100,000 kWh accounted for 66 percent of total savings, resulting in more sites being selected in this stratum.

### **On-Site Visit Protocol**

An on-site visit protocol listing the information to be collected for each site was developed. For each site, the information on the type and number of products, the wattage or the capacity and the characteristics of old and new products installed was collected. Furthermore, information on the facility's heating and cooling equipment and usage was also collected when applicable. In addition, the hours of operation were collected for each facility visited, based on the contact declaration.

The detailed on-site visit protocol is presented in Appendix VI.

## **4.2 GROSS SAVINGS**

The gross savings estimation was computed based on the information available in the program tracking sheet as well as on the data collected during the on-site visits and the savings review.

The tracking sheet provided for 2011 contains a total of 130 entries, all of which were completed projects. The measures in the BER program cover seven categories, with some categories presenting several sub-categories. A specific savings calculation methodology is used for each category or sub-category of measures.

The structure of the tracking sheet does not allow for a systematic validation of the savings calculations for all measures. However, after validating the calculation approach for several measures through an analysis of the savings equation used for each measure, the approach was found to be accurate.

To validate the program gross demand savings, Econoler reviewed the savings methodology and used the on-site visits to recalculate savings by measure using the appropriate savings equation, and corrections were made when required. By analyzing all project documents within the database and with information collected during the site visits, savings were calculated specifically for these 11 participants. The savings value obtained for each measure was compared to the value in the tracking sheet. When savings were found to be different, an adjustment was made for each site where an on-site visit had been conducted. The impact of these adjustments was reflected on the total gross demand savings calculated for the evaluation for each category when applicable.

For the 11 on-site visits conducted, gross energy savings values were adjusted based on the hours of operation declared during on-site visits, when necessary. Currently, the hours of operation for most measures are indicated by participants on the application forms. However, for certain refrigeration measures, the hours of operation used in the savings calculations are fixed values sourced from Efficiency Vermont's TRM. This is the case for cooler night covers, zero-energy doors and evaporator fan motor controls. Moreover, fixed hours of operation are used when the hours of operation in the contact declaration are not deemed acceptable by the PA. During the on-site visits, hours of operation were collected based on the site contact declaration and were used to calculate energy savings. Energy savings were adjusted when values calculated based on information collected on-site was different from the data in the tracking sheet.

It is to be noted that the on-site visits were scheduled mainly for quality assurance; consequently, the number of on-site visits was established based on the percentage of total savings for each category of products installed. Considering that only 11 on-site visits were to be carried out for all the measures implemented through the program, sample sizes for all categories were too low to establish reliable adjustment values applicable to all measures in each category. Moreover, no adjustment is presented for compressed air or laundry measures, as no site visit was conducted for these categories. However, for future evaluations, the evaluator recommends conducting on-site visits for these categories

#### **4.2.1 Lighting Measures**

When the wattage information for the old equipment is not available, standard values are used. Standard values are also used for some new equipment. Those values are sourced from the Office for Energy Efficiency or from Efficiency Vermont's TRM. The information in the tracking sheet does not allow the Evaluator to modify the unitary wattage values used to calculate the savings should they be found to be incorrect. However, for each of the eight sites with lighting measures implemented where on-site visits were performed, the demand savings were calculated using the appropriate values. The demand savings calculations take into account the equipment wattage values and the number of units installed on site, based on the information collected during the visit. Thus, the installation rate is included in this calculation as savings are calculated considering the number of units installed only. The adjustments on demand savings for the eight on-site visits conducted represented a total reduction of 19.33 kW, or 1.9 percent of the total demand savings for lighting products. This reduction was applied to the total tracked demand savings value.

The hours of operation collected for each site were used to calculate the energy savings. These values were collected for sections of the facility where the lights purchased through the program were used, based on contact declaration. These energy savings values were compared to the values in the tracking sheet to establish the energy savings adjustments resulting from these comparisons. The adjustments on energy savings for the eight on-site visits conducted represented a total reduction of 48.83 MWh, or 0.9 percent of the total energy savings for lighting products. This reduction was applied to the total tracked energy savings value.

Since only eight on-site visits were conducted for this category, no further adjustment was applied on savings for the lighting category.

The evaluator recommends increasing the number of on-site visits conducted for this category of measures in order to obtain adjustment values that could be applied to all projects in this category.

#### **4.2.2 HVAC Measures**

Savings calculations are based on efficiency and capacity values for the old and replacement equipment. When those values are not provided on the project applications they are evaluated by the PM or replaced with standard baseline values. Only one on-site visit was conducted for this category of measures and that visit allowed for equipment details to be collected. The site contact for this visit indicated that the systems installed were only used for cooling as opposed to what was indicated in the tracking sheet. The systems installed were not used for heating purposes, hence demand savings were adjusted to 0 kW for that site. This adjustment represents a reduction of 2.51kW, or 2.8 percent of the total demand savings for the HVAC category. This reduction was applied to the total demand savings.

Moreover, energy savings for the one site where an on-site visit was conducted were reduced by 6.58 MWh based on the information collected during the site on-visit. This adjustment represents a reduction of 2.0 percent of total energy savings for the HVAC category. This reduction was applied to the total energy savings.

It is to be noted that since only one on-site visit was conducted for this category, and considering the unexpected nature of the findings, no further adjustment was applied to savings for the HVAC category.

The Evaluator recommends that the PM confirm equipment usage with participants before using default full load hours when the information is not provided on the application. This would reduce the risk of overestimating savings in the event that the usage projected by the applicant greatly differs from standard values. Moreover, it is recommended to increase the number of on-site visits conducted for this category of measures in order to obtain adjustment values that could be applied to all projects.

#### **4.2.3 Motor and Drives Measures**

For drive measures, a commissioning factor of 1.1 is used for most measures in the tracking sheet. This commissioning factor is used to increase energy and demand savings for projects that underwent a commissioning process. However, the PM has no indication that such an activity was conducted by the applicants. Thus, the commissioning factor should not be accounted for in the savings calculations. Savings for drive measures were adjusted accordingly, when necessary, to correct the additional savings provided by the use of a commissioning factor. Moreover, for the on-site visit

conducted, savings were calculated using a load profile approach and were compared with the savings in the tracking sheet. Such an approach allows considering unique site conditions and presents a better estimate of the savings. The demand savings calculated with this approach and without the commission factor were used instead of the value in the tracking sheet for that one site, resulting in an increase of 7.7 percent.

The energy savings were calculated using the demand savings value calculated and the hours of operation declared by the site contact, and were used to replace the energy savings value in the tracking sheet. Energy savings were reduced by 40.6 percent for this site. However, the savings for other projects were not modified based on the adjustment conducted for this project, since a single site visit was not deemed representative.

No site visit was conducted for motor measures. Considering that the methodology to calculate savings for this measure presents significant differences with the methodology used for drives savings, the adjustment established for drives measures was not applied to motor measures.

The demand and energy adjustment values for the motor and drives category were established by calculating the impact of the VSD adjustments on the total savings for this category. Demand savings for the overall category were increased by 0.9 percent while energy savings were reduced by 11.9 percent.

The evaluator recommends increasing the number of on-site visits conducted for this category of measures and including on-site visits for motor installations.

#### **4.2.4 Occupancy Sensor Measures**

Savings are calculated as a percentage of reduction of the hours of operation, before measure implementation, for each category of building and on the total wattage of the lamps controlled by each occupancy sensor device. The hours of operation are provided by the participant through self-declaration. One on-site visit was conducted for this measure. This visit allowed for the collection of information on wattage of lamps controlled by the occupancy sensor. The information collected resulted in a 16.73 percent increase in energy savings for this site due to a difference between lamp wattage values from the tracking sheet and from the on-site verification. However, this adjustment was not applied to all projects in this category since no conclusion could be drawn from a single site visit. However, the energy savings increase calculated for the one on-site visit conducted represented an increase of 0.1 percent of total energy for the occupancy sensor category. As a result, total tracked energy savings for the overall category were increased by 0.1 percent.

As for demand savings, values in the tracking sheet were calculated based on energy savings by dividing the energy savings value by the hours of operation. This represents the maximum demand savings during peak load, considering that lighting usage reductions occur during the whole peak load period, as presented in Efficiency Vermont TRM. The data collected on site for occupancy sensors did

not provide sufficient elements to verify this hypothesis. Moreover, during on-site visits for the lighting category, all the applicants indicated that lighting systems were in use at their facilities during the peak load period. As a result, it can be assumed that if occupancy sensors were installed at these facilities, usage reduction would not occur during the peak load. As a result, demand savings were reduced to 0 kW for all projects in the occupancy sensor category. This approach, based on coincidence between the demand reduction and the peak load period, is consistent with the approach used by the Ontario Power Authority (OPA) in its Quasi-Prescriptive Measures and Assumptions report<sup>6</sup>.

In order to be able to consider the impact of occupancy sensors on peak demand, the Evaluator recommends that information on the period when the usage reduction occurs be collected in the application form. Moreover the number of on-site visits conducted for this category of measures should be increased in order to obtain adjustment values that could be applied to all projects.

#### **4.2.5 Refrigeration Measures**

Average values are used for heat gains, while benefit factor and compressor efficiency values are used in savings calculations for measures in this category. The on-site visit conducted for this category indicated that the values used by the PM to calculate demand and energy savings were accurate. Thus, no adjustment was conducted on the values in the tracking sheet for this project. Moreover, no adjustment was applied to tracked savings values for other projects in this category.

The Evaluator recommends that data on the refrigeration unit temperature and on the hours of usage be collected for all refrigeration measures to better evaluate the savings. Furthermore, the number of on-site visits conducted for this category of measures should be increased in order to obtain adjustment values that could be applied to all projects.

#### **4.2.6 Diversity Factor**

Based on the information received from ENSC, the peak period for electricity demand in Nova Scotia occurs in December, January and February between 7 a.m. and 12 p.m. as well as between 4 p.m. and 11 p.m. on a weekday that is not a holiday<sup>7</sup>. ENSC recommended using the 5 p.m. to 7 p.m. timeframe as the peak load period for the evaluation.

In order to evaluate the peak demand for demand savings, hours of operation were investigated for all the sites visited during on-site visits. For each site from each category of measures, the percentage of

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<sup>6</sup> OPA, 2011 Quasi-Prescriptive Measures and Assumptions, Release Version 1, December 2010, <http://www.powerauthority.on.ca/sites/default/files/2011%20Quasi%20Prescriptive%20Release%20Version%201%20%28December%202010%29.pdf>.

<sup>7</sup> Nova Scotia Power, Domestic Service Time-Of-Day Tariff, <http://www.nspower.ca/en/home/aboutnspi/ratesandregulations/electricityrates/domesticservicetimeofdaytariffoptional.aspx>.

total demand savings occurring during the peak demand period was established. These values were used to determine the diversity factor for each category of measures, except for the compressed air, laundry and refrigeration categories. For the first two categories listed, the diversity factor corresponds to the weighted average of the values obtained for the other categories, and the total savings for each of these categories. For the refrigeration category, the diversity factor was calculated based on the expected diversity factor for each type of measures installed for this category in 2011 as well as on the total savings for each of these measures. The diversity factor for this category corresponds to the weighted average of these values. The diversity factor values obtained for each category are presented in Table 18.

**Table 18: Diversity Factors**

| <b>Category of Measures</b> | <b>2011<br/>Diversity Factor</b> |
|-----------------------------|----------------------------------|
| Compressed air systems      | 99.4%                            |
| HVAC systems                | 100.0%                           |
| Lighting systems            | 100.0%                           |
| Laundry Systems             | 99.4%                            |
| Motor and drives systems    | 100.0%                           |
| Occupancy sensors           | 0 %                              |
| Refrigeration systems       | 97.9%                            |

#### **4.2.7 Revised Gross Savings**

Energy and demand savings for the program were revised to include the adjustment presented in the sections above. Using the diversity factors calculated for each category, the peak demand was established. Savings at the generator level were calculated using a line-loss factor of 1.067 between the meter and the generator. This value was calculated using the weighted average of the line loss factor values for each project (obtained with their rate code) in the tracking sheet with the energy savings of the corresponding projects. The line loss factors were provided by Nova Scotia Power for each rate code.

The savings obtained for each category of measures are presented in Table 19.

The total gross energy savings for the BER program are estimated at 8.754 GWh at the meter and at 9.340 GWh at the generator. The total gross demand savings are estimated at 1.775 MW at the meter and at 1.895 MW at the generator.

**Table 19: Evaluation Results – Revised Gross Savings**

| Measure Category                                           | Compressed Air Systems | HVAC Systems | Laundry Systems | Lighting Measures           |                         | Motor and Drives Systems | Occupancy Sensors | Refrigeration Systems |
|------------------------------------------------------------|------------------------|--------------|-----------------|-----------------------------|-------------------------|--------------------------|-------------------|-----------------------|
|                                                            |                        |              |                 | For Non-refrigerated Spaces | For Refrigeration Units |                          |                   |                       |
| <b>Program Tracking Sheet</b>                              |                        |              |                 |                             |                         |                          |                   |                       |
| Total program tracking savings (GWh)                       | 0.267                  | 0.328        | 0.0005          | 4.161                       | 1.436                   | 0.143                    | 0.176             | 2.317                 |
| Total program tracking demand savings (MW)                 | 0.034                  | 0.088        | 0.003           | 0.922                       | 0.239                   | 0.028                    | 0.047             | 0.486                 |
| <b>Evaluated Energy Savings</b>                            |                        |              |                 |                             |                         |                          |                   |                       |
| Adjustment for energy savings                              | 0.0%                   | -2.0%        | 0.0%            | -0.9%                       | -0.9%                   | -11.9%                   | 0.1%              | 0.0%                  |
| <b>Total Gross Energy Savings – at Meter (GWh)</b>         | <b>0.267</b>           | <b>0.321</b> | <b>0.0005</b>   | <b>4.124</b>                | <b>1.423</b>            | <b>0.126</b>             | <b>0.176</b>      | <b>2.317</b>          |
| Line loss factor                                           | 1.067                  | 1.067        | 1.067           | 1.067                       | 1.067                   | 1.067                    | 1.067             | 1.067                 |
| <b>Total Gross Energy Savings – at Generator (GWh)</b>     | <b>0.285</b>           | <b>0.343</b> | <b>0.0005</b>   | <b>4.400</b>                | <b>1.518</b>            | <b>0.134</b>             | <b>0.188</b>      | <b>2.472</b>          |
| <b>Evaluated Demand Savings</b>                            |                        |              |                 |                             |                         |                          |                   |                       |
| Adjustment on demand savings                               | 0.0%                   | -2.8%        | 0.0%            | -1.9%                       | -1.9%                   | 0.9%                     | -100.0%           | 0.0%                  |
| <b>Total Gross Demand Savings – at Meter (MW)</b>          | <b>0.034</b>           | <b>0.086</b> | <b>0.003</b>    | <b>0.904</b>                | <b>0.234</b>            | <b>0.028</b>             | <b>0</b>          | <b>0.486</b>          |
| Diversity factor                                           | 99.4%                  | 100%         | 99.4%           | 100%                        | 100%                    | 100%                     | 0%                | 97.9%                 |
| <b>Total Gross Peak Demand Savings – at Meter (MW)</b>     | <b>0.034</b>           | <b>0.086</b> | <b>0.003</b>    | <b>0.904</b>                | <b>0.234</b>            | <b>0.028</b>             | <b>0</b>          | <b>0.476</b>          |
| Line loss factor                                           | 1.067                  | 1.067        | 1.067           | 1.067                       | 1.067                   | 1.067                    | 1.067             | 1.067                 |
| <b>Total Gross Demand Savings – at Generator (MW)</b>      | <b>0.036</b>           | <b>0.092</b> | <b>0.003</b>    | <b>0.965</b>                | <b>0.250</b>            | <b>0.030</b>             | <b>0</b>          | <b>0.519</b>          |
| <b>Total Gross Peak Demand Savings – at Generator (MW)</b> | <b>0.036</b>           | <b>0.092</b> | <b>0.003</b>    | <b>0.965</b>                | <b>0.250</b>            | <b>0.030</b>             | <b>0</b>          | <b>0.508</b>          |



## **4.3 INTERACTIVE EFFECTS**

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling systems. In the case of the BER program, replacement of regular lighting products with efficient lighting products and installation of occupancy sensors cause an increase in the heating load during winter and a decrease in the cooling load during summer. However, interactive effects are already considered in the tracking sheet for the savings calculations of occupancy sensors.

For all lighting products, except the ones installed in refrigeration units, a total interactive effects factor of -7.7 percent was used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work conducted in this study was intended to modify certain parameters in building simulations of commercial buildings in Quebec in order to determine the impact of these changes on heating and cooling systems. The simulations were performed with the DOE2 software and only focused on buildings heated entirely by electricity.

The following table presents the calculation details for the interactive effects. The values presented take into account the proportion of commercial buildings that are electrically heated and the proportion that are air conditioned. These proportions were obtained from the on-site visits conducted for all commercial and institutional programs, except for the C&IC and Efficient Products-Direct Install programs. Data from the latter were excluded since the information collected on heating and cooling systems during the on-site visits for these programs were not representative of C&I facilities. C&IC program participants included a significant proportion of industrial customers, rendering the information collected difficult to use for other C&I programs. Sites with electric heating systems were over-represented in the sample used for EP-DI on-site visits. Information for a total of 34 sites was collected to establish the interactive effects factor. For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&I telephone survey campaigns conducted by ENSC. This would provide for a better evaluation of the interactive effects factor.

**Table 20: Interactive Effects Factor for Lighting Products<sup>†</sup>**

| Parameters                                   | % Commercial Buildings | Interactive Effects <sup>8</sup> |
|----------------------------------------------|------------------------|----------------------------------|
| Electric heating with air conditioning       | 14.71%                 | -43.4%                           |
| Electric heating without air conditioning    | 8.82%                  | -49.0%                           |
| No electric heating with air conditioning    | 52.94%                 | 5.7%                             |
| No electric heating without air conditioning | 23.53%                 | 0.0%                             |
| <b>Weighted Interactive Effects Factor</b>   | <b>-</b>               | <b>-7.7%</b>                     |

<sup>†</sup> Values in the table do not apply to lighting products installed in refrigeration units since these effects are already taken into account in savings calculations for these products.

The gross savings including interactive effects factor are presented in Table 21.

**Table 21: Gross Savings at the Meter – Including Interactive Effects**

|                                                     | Energy Savings (GWh)                         |                | Demand Savings (MW)                          |                |
|-----------------------------------------------------|----------------------------------------------|----------------|----------------------------------------------|----------------|
|                                                     | Lighting Measures in Non-refrigerated Spaces | Other Measures | Lighting Measures in Non-refrigerated Spaces | Other Measures |
| Total Gross Savings                                 | 4.124                                        | 4.630          | 0.904                                        | 0.876          |
| Interactive Effects Factor                          | -7.7%                                        | 0%             | -7.7%                                        | 0%             |
| Total Gross Savings with Interactive Effects Factor | 3.806                                        | 4.630          | 0.834                                        | 0.876          |

After applying the interactive effects factor to the lighting measures in non-refrigerated spaces, the total gross energy and demand savings at the meter for the BER program are estimated at 8.436 GWh and at 1.710 MW, respectively.

<sup>8</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

## 4.4 NET-TO-GROSS RATIO

The NTGR evaluation of the program is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on participants' decision to purchase program-eligible energy-efficient products. These questions were included in the participant survey.

This section presents the methodology used to transform responses to NTGR survey questions into a NTGR. For the program, the NTGR includes the assessment of two distortion effects: free-ridership and internal spillover. Once each effect is quantified, the NTGR is calculated based on this equation:

$$\text{Net-to-gross ratio} = (1 - \% \text{ free-ridership} + \% \text{ internal spillover}).$$

### 4.4.1 Free-Ridership

In the BER program, free-ridership can occur when participants declare they would still have purchased the efficient products in the absence of the program. In 2011, ENSC started screening participants for free-ridership before approving their application. The answers provided by the participants during this process were taken into account in conjunction with telephone survey answers.

The telephone survey included eight free-ridership questions divided into four groups that attempted to measure:

- > the probability that the customer would have purchased the same energy-efficient products in the absence of the program;
- > the probability that the customer would have paid the full cost of the product in the absence of the program;
- > the factors, other than the program, that might have affected the customer's decision; and
- > the temporal sequence of the program and the customer's decision.

Each group of questions is transposed into a level of program attribution used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix VII.

The most important elements of the approach used to estimate the free-ridership level of the program in 2010 were preserved in Econoler's approach. However, a few enhancements were incorporated:

- > Introduction of a 0 to 10 scoring system rather than fixed categories that were assigned weights.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participants' energy efficiency decision making rather than focusing narrowly only on their rating of the program's importance. This question structure more accurately reflects the complex nature of real-world decision making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania.

Using this approach, survey results reveal a free-ridership level of 17.6 percent. The 2010 evaluation presented a 46 percent free-ridership level for the program. The free-ridership level obtained for 2011 is significantly lower than the one obtained in 2010. This difference could be the result of screening all applications for free-ridership before approval.

#### **4.4.2 Spillover**

For this program, internal spillover effects are measured through the participant survey. Internal spillover can occur when participants purchase eligible energy-efficient products following their previous participation in the program when the purchase is due to the program's influence, showing the advantages of such products.

During the telephone survey, participants were asked if they had bought and installed additional energy-efficient products following their previous participation in the program. Additional questions were used to verify the eligibility of the additional purchases by asking:

- > the date of the purchase to ensure that it was made after participating in the program; and
- > if they benefited from any other financing or incentive program for these additional purchases, or if they planned to submit a rebate request for these purchases in the future.

Subsequently, other questions were asked to verify the level of influence of the program on the purchase.

Finally, follow-up calls were made to participants flagged for spillover. These calls were used to confirm participants' declarations and collect product specifications that could not be collected during the telephone survey. These specifications (product type, quantity, product replaced, etc.) were then used to estimate the energy savings associated with the purchase. Depending on the level of influence obtained during the survey, a portion of these savings was attributed to the program.

The level of internal spillover was calculated for each participant, according to this equation.

$$\%SO = \frac{kWh \text{ associated with the additional purchase} \times \text{attribution level}}{kWh \text{ associated with the products installed under the program}}$$

The 2010 program evaluation revealed no internal spillover. This year, a new approach using in-depth interviews with participants was used to capture potential internal spillover. Nevertheless, the estimated level of internal spillover remains low. Only one of the four participants flagged for spillover confirmed having purchased additional energy-efficient products following previous participation in the program. These additional purchases correspond to energy savings attributable to the program totalling 4.72 MWh for this participant. Spillover represented 0.2 percent of total energy savings for all participants surveyed. It is to be noted that, in most cases, the interviews were conducted shortly after the participants had implemented the energy-saving measures, thereby not leaving much time for them to implement additional measures.

Based on the free-ridership and spillover values calculated for 2011, the NTGR is estimated at 0.83.

## 4.5 NET SAVINGS

The net savings for the program were estimated using the NTGR above. The equation below was used to calculate the program net savings.

$$\text{Net savings} = \text{gross evaluation savings} \times \text{net-to-gross ratio}$$

This equation was used for both demand and energy savings. The results obtained are presented in Table 22. For 2011, the total net energy savings at the generator level are estimated at 7.002 GWh, while net demand savings at the generator are estimated at 1.419 MW.

**Table 22: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR        | Net Savings      |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 9.483 GWh             | 9.483 GWh               | 9.483 GWh                                        | 0.75        | 7.112 GWh        |
| <b>Evaluation Results</b> | <b>9.760 GWh</b>      | <b>9.340 GWh</b>        | <b>8.436 GWh</b>                                 | <b>0.83</b> | <b>7.002 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 1.977 MW              | 1.977 MW                | 1.977 MW                                         | 0.75        | 1.483 MW         |
| <b>Evaluation Results</b> | <b>1.963 MW</b>       | <b>1.895 MW</b>         | <b>1.710 MW</b>                                  | <b>0.83</b> | <b>1.419 MW</b>  |

The net energy values calculated were compared to the program tracked savings for 2011. The values calculated were slightly lower than the values tracked. This can be explained by adjustments calculated from on-site visits and applied to the tracked gross savings as well as by the interactive effects factor of -7.7 percent applied to the savings for lighting products installed in non-refrigerated spaces. The NTGR used for the evaluation was higher than the one used for tracked savings. However, this increase was not sufficient to overcome the reduction in energy savings resulting from the adjustments.

## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>1. Document important program assumptions or practices:</b></p> <ul style="list-style-type: none"> <li>– The Evaluator understands that the measures included in the program as well as the gross savings they generate are based on a similar program run by EVT. Regardless, the program manual should incorporate all details from EVT on each measure and the savings assumptions for program memory purposes.</li> <li>– The rationale behind the incentives calculation seems adequate based on possible yields from market transformation and the level of participation. Furthermore, the incentives calculation was designed to cover from 20 to 40 percent of material costs, which represent the incremental cost as well as early replacement costs in some cases. The Evaluator recommends including this important information in the program manual since costs fluctuate over time and rebates will have to be adjusted frequently.</li> <li>– The program manual should document the criteria for selecting projects that will be inspected.</li> <li>– The scoring mechanism to calculate the free-ridership percentage from the three questions included in the application form should be documented in the program manual.</li> </ul> |
|                               | <p><b>2. Provide the parameters used to estimate program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects, when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PA and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                               | <p><b>3. Refine and disseminate the marketing plans:</b> Marketing plans, even if they are prepared in another department, should cover a whole year of activities and be included in the program manual. For each activity, the plans should identify the performance indicators to be collected for monitoring and evaluation purposes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>4. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written but important information that would serve as “program memory” in case of modifications or staff changes is missing. The program manual content should be updated, for instance, by including the most recent forms with their version number and revision date. Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Program Tracking Sheet</b> | <p><b>5. Break down the values used for savings calculations in different cells:</b> This will allow the Evaluator to validate the savings calculations for each measure in the database. Currently, all the values are contained in one cell, not allowing for a systematic validation of the savings for each measure. A simple reorganization of the database would make this operation possible. The number of products as well as characteristics such as wattage, horse-power (HP) and seasonal energy efficiency ratio (SEER) should each be contained in their own cell. However, considering the multitude of approaches used to calculate the energy savings for this program, it is useful to keep the detailed equation in the tracking sheet, as the savings calculation parameters can vary from one project to another.</p> <p><b>6. Include measure sub-categories for categories with several measures:</b> Most categories of measures include several sub-categories. This is the case for Compressed Air, HVAC, Lighting, Motors and Drives and Refrigeration. The savings calculation approach is often very different from one sub-category to the other. Moreover, baseline values are established based on the measure sub-category. Including the sub-category of the measure in the database would allow the selection of the appropriate approach and baseline values to calculate savings during the evaluation process.</p> <p><b>7. Break down the address information:</b> Currently, the address information for each participant is contained in one cell. This complicates site selection based on location for field activities. Presenting the address information in three cells – street address, city and postal code – will greatly facilitate this process.</p> <p><b>8. Ensure that all fields are systematically filled in:</b> It is recommended that the PM ensure that all tracking sheet fields are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered in the tracking sheet. At the time of the analysis for the 2011 tracking sheet, the fields listed below presented several missing values:</p> <ul style="list-style-type: none"> <li>– postal code used as part of the client’s address – this field was empty for more than 10 percent of the records;</li> <li>– bill account number used to match customer finance and consent forms – this field was empty for almost 50 percent of the records. However, that information is available in the online database for each project and should also be in each project paper file. The tracking should then be updated to reflect that fact.</li> </ul> |



|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b>            | <b>9. Standardize the entries:</b> To prevent the same information from being entered in different ways in the tracking sheet, ENSC should integrate a drop-down list of answers when possible. For instance, in the 2011 tracking, the Motors and Drives category is identified in three different ways. This will facilitate the site sampling process and the savings validation once a systematic validation can be conducted.                                                                                                                                                                                                                                                                                                                                            |
| <b>Program Design and Implementation</b> | <b>10. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. Econoler strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific topics important to the PA are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology. |
|                                          | <b>11. Monitor the delay to process the application:</b> The 30-day delay to process the application and receive the incentive should be monitored to ensure that it is respected and avoid any complaints regarding delays.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                          | <b>12. Inform participants about expected customer savings:</b> Once the final rebate is disbursed to clients, Econoler recommends informing them about the approximate savings in terms of energy and money to be expected from the project, which will represent an added value to the customer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>ENSC Website</b>                      | <b>13. Include a revision date on the application form:</b> Econoler recommends including a revision date on the application form available on the website for better tracking and referencing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Participant Perspectives</b>          | <b>14. Focus on energy bill savings in program communications:</b> Since survey results indicate that saving on energy costs is the most important motivation for installing energy-efficient equipment and for participating in the BER program, program activities and documentation should continue to focus on energy bill savings.                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Participant Perspectives</b> | <b>15. Provide information to participants on program portfolio:</b> The results show a very positive attitude and a high level of motivation toward energy efficiency among participants. However, survey results indicate that the majority of participants had not participated in another program prior to the BER program and did not purchase eligible energy-efficient products following their participation in the BER program (internal spillover, see Section 4.4.2 for more details). This could be a mere timing issue since their participation was fairly recent. However, ENSC could still promote additional actions to participants by providing information on its other programs. |
|                                 | <b>16. Increase program promotion:</b> In terms of suggestions for improving the BER program, a small number of respondents would like more information or information sessions (14%), better marketing of the program (12%) or better communication between customers and program staff (9%).                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Impact Evaluation</b>        | <b>17. Conduct on-site visits for compressed air or laundry measures:</b> It is to be noted that no adjustment is presented for compressed air or laundry measures, as no site visit was conducted for these categories. However, for future evaluations, the evaluator recommends conducting on-site visits for these categories.                                                                                                                                                                                                                                                                                                                                                                    |
|                                 | <b>18. Increase the number of on-site visits for the lighting category:</b> Since only eight on-site visits were conducted for this category, no further adjustment was applied on savings for the lighting category. The evaluator recommends increasing the number of on-site visits conducted for this category of measures in order to obtain adjustment values that could be applied to all projects in this category.                                                                                                                                                                                                                                                                           |
|                                 | <b>19. Increase the number of on-site visits for the HVAC category:</b> The Evaluator recommends that the PM confirm equipment usage with participants before using default full load hours when the information is not provided on the application. This would reduce the risk of overestimating savings in the event that the usage projected by the applicant greatly differs from standard values. Moreover, it is recommended to increase the number of on-site visits conducted for this category of measures in order to obtain adjustment values that could be applied to all projects.                                                                                                       |
|                                 | <b>20. Increase the number of on-site visits for the motors and drives category:</b> The evaluator recommends increasing the number of on-site visits conducted for this category of measures and including on-site visits for motor installations.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Impact Evaluation</b> | <p><b>21. Increase the number of on-site visits for the occupancy sensors category:</b> In order to be able to consider the impact of occupancy sensors on peak demand, the Evaluator recommends that information on the period when the usage reduction occurs be collected in the application form. Moreover the number of on-site visits conducted for this category of measures should be increased in order to obtain adjustment values that could be applied to all projects.</p> |
|                          | <p><b>22. Increase the number of on-site visits for the refrigeration category:</b> The Evaluator recommends that data on the refrigeration unit temperature and on the hours of usage be collected for all refrigeration measures to better evaluate the savings. Furthermore, the number of on-site visits conducted for this category of measures should be increased in order to obtain adjustment values that could be applied to all projects.</p>                                |
|                          | <p><b>23. Collect information on the heating source and on the use of air conditioning during C&amp;I telephone survey campaigns:</b> For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&amp;I telephone survey campaigns conducted by ENSC. This would provide for a better evaluation of the interactive effects factor.</p>                  |

## APPENDIX II – FIRMOGRAPHICS

Respondents were asked to estimate their energy costs as a percent of their annual budget. Fifteen respondents offered a definite response. From these, six indicated that energy is less than 10 percent of their organization's annual operating budget. For a few organizations (2), energy costs make up more than one-half of their annual operating budget. The average is 20 percent.

**Table 23: Energy Costs as a Percent of Annual Operating Budget**

| <b>Percent of Budget</b>       | <b>2010 (#)</b> | <b>2011 (#*)</b> |
|--------------------------------|-----------------|------------------|
| <i>Sample Size</i>             | <i>11</i>       | <i>15</i>        |
| Less than 10%                  | 2               | 6                |
| 10-19%                         | 3               | 2                |
| 20-29%                         | 1               | 4                |
| 30-39%                         | --              | 1                |
| 40-49%                         | --              | --               |
| 50-59%                         | --              | --               |
| 60-69%                         | 1               | 1                |
| 70-99%                         | --              | 1                |
| Don't know                     | 4               | --               |
| <b>Average Percent</b>         | <b>17%</b>      | <b>20.3%</b>     |
| *Don't know removed from table |                 |                  |

The respondents represented a diverse range of business types.

**Table 24: Principal Building Activity**

| <b>Principal Building Activity</b> | <b>2010 (#)</b> | <b>2011 (%)</b> |
|------------------------------------|-----------------|-----------------|
| <i>Sample Size</i>                 | <i>11</i>       | <i>43</i>       |
| Retail (other than mall)           | 2               | 19%             |
| Property management                | --              | 14%             |
| Manufacturing                      | --              | 9%              |
| Farming                            | --              | 7%              |
| Electrical distribution            | --              | 7%              |
| Government                         | --              | 7%              |
| Food processing/manufacturing      | 1               | 5%              |
| Food service (restaurant)          | --              | 5%              |
| Food sales (grocery)               | --              | 2%              |
| Health care – outpatient           | --              | 2%              |
| Lodging                            | --              | 2%              |
| Warehouse/storage                  | --              | 2%              |
| Retail (enclosed and strip malls)  | 1               | 2%              |
| Office                             | 1               | --              |
| Public assembly                    | 1               | --              |
| Automotive repair                  | 1               | --              |
| Religious worship                  | 1               | --              |
| Commercial property services       | 1               | --              |
| Forestry                           | 1               | --              |
| Other                              | --              | 16%             |

The number of employees varies among respondents. Two in 10 respondents have fewer than five full-time employees in their organization (21%), while three in 10 have 100 or more employees (28%).

**Table 25: Full-Time Equivalent Workers**

| <b>Full-Time Employees</b> | <b>2010 (#)</b> | <b>2011 (%)</b> |
|----------------------------|-----------------|-----------------|
| <i>Sample Size</i>         | <i>11</i>       | <i>43</i>       |
| Fewer than 5               | 2               | 21%             |
| 5 to 9                     | 1               | 9%              |
| 10 to 19                   | 3               | 14%             |
| 20 to 49                   | 2               | 12%             |
| 50 to 99                   | 1               | 12%             |
| 100 to 249                 | 1               | 12%             |
| 250 or more                | 1               | 16%             |
| Don't know                 | --              | 5%              |

Half of respondents (51%) report that their business is open 40 to 79 hours per week, while one-quarter (26%) report their business is open 80 to 119 hours per week. The average number of hours per week during which organizations are open is 87.

**Table 26: Hours of Operation**

| <b>Hours per Week</b> | <b>2010 (#)</b> | <b>2011 (%)</b> |
|-----------------------|-----------------|-----------------|
| <i>Sample Size</i>    | <i>11</i>       | <i>43</i>       |
| Less than 40          | 1               | 3%              |
| 40 to 79              | 8               | 51%             |
| 80 to 119             | 1               | 26%             |
| 120 or more           | 1               | 21%             |
| <b>Average Hours</b>  | 68              | 87.2            |
| <b>Days per Week</b>  | --              | 6.1             |

Two-thirds of respondents report that their business is independent (67%), while three in 10 are part of a larger company (30%).

**Table 27: Type of Company**

| <b>Type of Company</b>   | <b>2010 (#)</b> | <b>2011 (%)</b> |
|--------------------------|-----------------|-----------------|
| <i>Sample Size</i>       | <i>11</i>       | <i>43</i>       |
| Independent              | 8               | 67%             |
| Part of a larger company | 3               | 30%             |
| Don't know               | --              | 2%              |

The majority of respondents report that their organizations have between one and five business locations in Nova Scotia (72%), and two in 10 have six or more business locations (21%).

**Table 28: Number of Facilities in Nova Scotia**

| <b>Number of Facilities</b> | <b>2010 (#)</b> | <b>2011 (%)</b> |
|-----------------------------|-----------------|-----------------|
| <i>Sample Size</i>          | <i>11</i>       | <i>43</i>       |
| 1-5                         | 4               | 72%             |
| 6 or more                   | --              | 21%             |
| Don't know                  | 2               | 7%              |
| <b>Average*</b>             | 2               | 6.5             |

## **APPENDIX III – INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

#### **Program Name: Business Energy Rebates (BER)**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                      |
|--------------------------------------|
| <b>Source: 210 Evaluation report</b> |
|--------------------------------------|

#### **Page II (Key Findings)**

Q: “Improve incentive levels and develop a rational incentive structure” Can you comment on that recommendation?

BER-R1 What is the status of this recommendation about the free-riders (46%) is it the 3 questions you ask in the application form available from your web site?

BER-R2 Are you using more contractors and design professionals to promote the program?

#### **Page 1**

Q: The savings estimates for that program came from EVT ? Was there any adjustments made to these estimates before or after implementation?

Q: What is the reason for the \$2000 limit to seek approval from the PM?

#### **Page 4**

Q: Any modifications to the program that will require modifying the logic model?

|                                 |
|---------------------------------|
| <b>Source: Program Brochure</b> |
|---------------------------------|

C: Very good and clear document, complete and with smart advises prior to buying any equipment (to make sure it qualifies)



**Source: Web Site**

### **How to apply**

Q: The fact that the program accepts measure that has been purchase and install before requesting the incentive is that first you want to make sure its installed and second because the measure is in the approved list without any doubt. Is that the theory or assumption?

### **Application form**

How do you deal with the questions about free-ridership? (you ask 3 questions).

C: The application form needs to have a revision date

### **The worksheets**

Q: Do you use 5 different databases for each of the 5 worksheets to collect participant data?

Q: Do you get requests for payment for measures that are not qualified for the incentive?

Q: If yes what is the percentage of these requests that are not admissible?

Q: Do you keep a record of these non-admissible requests per type of measure?

### **FAQ**

C: It's a good practice to confirm prior to installing the measures if they are admissible, especially if approved product change from time to time.

C: How do you proceed to inform the participant that he is not eligible to an incentive?

Q: Do you keep track of the 30 days delays to process applications? What is the status actually?

Q: # 9 Only installed products will be eligible for the rebate: How many inspection do you do and on what basis?

Q: What is the percentage of non-installed that you find?

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

Q: This manual is very impressive and carries to much information. The question is: To whom is it intended? To the participants, to the program partners, to ENSC, to all of them? Would it be easier to split in sections for each intended parties?

C: We take note that the program manual has a revision date, which is not the case for so many other ENSC program literatures. Good practice.

**Page 7**

C: We take note that there is an intention to centralize the 5 forms into one, which is very good and would like to know if this has been done yet?

Q: We also note that the savings calculations are done with the algorithms imbedded in the database, but our question is: Will the participant eventually know what will be the savings that he should expect from each measure?

**Page 8**

Q: The table of incentives for each measure repeats itself in the document. Is there any way to have it in one section for all the measures?

**Page 15**

Program data tracking (there are no page numbers in that section)

Q: This section looks like it's more for program management and should not concern participants. This is related to the previous question.

**Page 19**

Q: The check box to determine free riders is supposed to be on the application form page 5. We could not find that check in the form but it is in the application form available from the web. Care to comment?

Page 1 of the section that starts with “Business Energy Rebate Program (commercial lighting) does not carry a form name. It looks like it’s a series of instructions, questions and conditions, etc. that repeats itself for each measure (page 1 to 6). Could it be reduced to one for all the measures and it would have to carry a name or title. Do you care to comment?

## **Page 9**

Q: Who fills this worksheet? The program manager or the participant?

Q: Where does the data come from? The worksheets that are available from the Web site and filled by the participant?

Q: General comment: This program manual really needs to be simplified; there are too many repetitions.

## **CGI Document**

Q: We understand that this document is to calculate savings for 3 measures: Efficient lighting, efficient motors and variable frequency drives. The data comes from the measure worksheets and the algorithms are applied to calculate gross savings. Which worksheet are you referring to? The one the participant fills or the one that comes with the instructions for each measure in this program manual? This is not clear. Care to comment?

Q: The workflow is essential for such a program and it’s a very good thing to have. Do you plan to make a process work flow for the participant also, without the internal steps and activities that does not really concern him?

## **CGI and Nova Scotia Power document**

Q: We understand that this document describes a savings calculations imbedded into a database for the other measures of the program (HVAC, refrigeration and compressed air). Does the input data originate also from the worksheet (which one)?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: The participants don’t know the amount of savings they will get from installing one of the measures, even after they get accepted and receive their incentive. In your opinion does that represent a barrier to participation?

Q: Please describe who are the program partners and what are their roles. This should guide us in asking the appropriate questions in the process evaluation. (Sales leads, marketing contractor, etc.

Q: Where there any distortion effects forecasted in this program when it was designed? What were they? And how were they established?

Q: What were the barriers to that program?

Q: When the program was initially designed, was there an evaluation plan designed at the same time?

Q: The program marketing looks comprehensive. Is there a document that describes the marketing strategy and are there any performance indicators that are collected?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

Thank you

## **APPENDIX IV – INTERVIEWS GUIDE WITH PARTICIPANTS**

### **PARTICIPANT INTERVIEW GUIDE**

#### **ENSC BUSINESS ENERGY REBATES PROGRAM**

December 20, 2011

**Interviewer:**

**Date of Interview:**

**Company Contacted:**

**Respondent Name:**

**Title:**

**Phone Number:**

Hello, my name is \_\_\_\_\_ from Econoler.

Hello, may I please speak with \_\_\_\_\_?

1. Yes [GO TO INTRODUCTION]
2. Person responsible currently unavailable [ARRANGE CALL BACK WITH THE RIGHT PERSON]

#### **INTRODUCTION**

Hello, my name is \_\_\_\_\_, from Econoler. I am calling on behalf of Efficiency Nova Scotia Corporation regarding the evaluation of the Business Energy Rebates Program.

You were contacted in October by CRA for a survey regarding your participation in the BER program for \_\_\_\_\_ products. Further to such participation, we would like to obtain details regarding the additional purchases of energy-efficient products you made since your participation in the BER program. Moreover, we would like to collect information on your experience with this program.

We would appreciate your collaboration in answering these additional questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The interview will take about 10 minutes. Is this a good time for you? (If not, set up another call)

---

**Confidentiality**

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses.

**Recording of the Interview**

Please note that the interview will be recorded. The recording will remain strictly confidential. It is simply a tool for me because I cannot write all the information that you will give me.

**HOURS OF OPERATION [H series]**

Before discussing the additional measures implemented, I would like to validate the hours of operation for the \_\_\_\_\_ measures you implemented.

H1. Can you recall the hours of operation for this equipment? If can't recall, ask to confirm the hours in the tracking sheet.

**SPILOVER [SP series]**

SP1. Our records from the October interview indicate that you implemented a \_\_\_\_\_ measure on your own, **after** participating in the BER program for a \_\_\_\_\_ measure. Is this correct?

- 1 Yes ☐ SP2
- 2 No ☐ Go to SP1a
- 98. (Don't know) Go to SP1a

SP1a. Did you implement another energy efficiency measure after participating in the BER program?

- 1 Yes ☐ SP1b
- 2 No ☐ Go to S1
- 98. (Don't know) Go to S1

SP1b. What type of additional energy efficiency measures did you implement after participating in the BER program?

SP2. From now on, I will specifically talk about the additional \_\_\_\_\_ (from survey results or from interview) measures which your company implemented on its own after participating in the BER program.

SP2a. Do you have a bill for this purchase that you could provide us? Or perhaps you could provide us with a feasibility study or the total price of the purchase?

Provide email: [halao@econoler.com](mailto:halao@econoler.com)

Fax: 418-692-7083

SP2b. What types of \_\_\_\_\_ products were purchased for this measure (category, wattage, capacity)?

*Take note of each type of product purchased.*

SP2c. How many \_\_\_\_\_ products of this type were purchased?

*Take note of the number of products purchased for each type.*

SP2d. When did you install this product (compare with date of participation in BER program)?

SP2e. Where did you purchase these products? (Prompt if the contact can't recall: Graybar, Liteco, Litemor, Nedco, Hussman (refrigeration), Greenwave, Electric contractor, other...)

SP2f. Did you claim a rebate through the BER program or through any other program for this product? If not, are you planning to claim a rebate for this product?

SP2g. Did you decide to implement the additional measures following your participation in the BER program or did you make the decision based on your technical knowledge or based on an electrician or supplier recommendation?

SP3. (Ask if an additional measure was implemented after participating in the BER program.)

Now, I will specifically talk about the \_\_\_\_\_ measure your company implemented on its own after participating in the BER program.

SP3a. Do you have a bill for this purchase that you could provide us? Or perhaps you could provide us with a feasibility study or the total price of the purchase?

Provide email: [halao@econoler.com](mailto:halao@econoler.com)

Fax: 418-692-7083

SP3b. What types of \_\_\_\_\_ products were purchased for this measure (category, wattage, capacity)?

*Take note of each type of product purchased.*

SP3c. How many \_\_\_\_\_ products of this type were purchased?

*Take note of the number of products purchased for each type.*

SP3d. When did you install this product (compare with date of participation in BER program)?

SP3e. Where did you purchase these products (Prompt: Graybar, Liteco, Litemor, Nedco, Hussman (refrigeration), Greenwave, Electric contractor, other...)?

SP3f. Did you claim a rebate through the BER program or through any other program for this product? If not, are you planning to claim a rebate for this product?

SP3g. Did you decide to implement the additional measures following your participation in the BER program or did you make the decision based on your technical knowledge or based on an electrician or supplier recommendation?

## **SATISFACTION, FUTURE PURCHASE INTENTIONS & RECOMMENDATIONS [S series]**

Now, I would like to discuss your overall satisfaction with the BER program.

S1. On a scale from 1 to 5, where 1 means “not at all satisfied” and 5 “very satisfied,” how satisfied are you with the following aspects of your experience with the BER program? [RANDOMIZE 1-15, THEN 16; 98 = Don't know/Don't recall, 99 = Refused] DO NOT ACCEPT A RANGE

1.    \_\_\_    Single point of contact
2.    \_\_\_    Interaction and communication with Program Manager
3.    \_\_\_    Assistance with program application
4.    \_\_\_    Project incentive amount
5.    \_\_\_    Paperwork and procedures required to receive incentives
6.    \_\_\_    The program overall



- S2. On a scale from 1 to 5, where 1 means “not at all likely” and 5 “very likely,” how likely is your company or organization to purchase energy-efficient products when installing or replacing energy-using products for your business in the future? [98 = Don’t know/Don’t recall, 99 = Refused]
- S3. Did you experience any specific challenge or face any barrier when implementing efficient measures through the BER program (related to product selection, eligibility, installation, etc.)? Which was the ONE most important barrier?
- S4. Did you encounter any issues or concerns while participating in the BER program (related to interactions with ENSC)? How were these issues or concerns addressed? How could they be addressed in the future?
- S5. Are there currently any energy efficiency measures, upgrades or actions that are not covered by the BER program or any other ENSC programs that you think should be included?
- S6. Do you have any suggestions on how to improve the BER program? Consider all aspects of the program: process (application process, rebate delivery, verification), marketing, interactions with staff and the Program Manager and program application forms.

## **APPENDIX V – PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

#### **ENSC Business Energy Rebates Program**

**September 29, 2011**

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

[INTRODUCTION]

Hello, I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your firm recently participated in Efficiency Nova Scotia Corporation’s Business Energy Rebates Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

### **VERIFICATION AND RECALL**

V1. Our records indicate that your company or organization participated in Efficiency Nova Scotia’s Business Energy Rebates Program. Is this correct?

1. Yes (Go TO V3)
2. No

V2. Is there someone else at your company or organization who would know about your company / organization's participation in Efficiency Nova Scotia's Business Energy Rebates Program?

1. Yes (Ask for name: \_\_\_\_\_ and telephone #: \_\_\_\_\_) (Thank and terminate; schedule interview with best contact)
2. No (Thank and terminate)

V3. Are you the person in your company or organization who is most knowledgeable about your experience with the Business Energy Rebates Program?

1. Yes (if YES go to V5)
2. No

V4. We would like to talk to the person who is the most knowledgeable about your experience with the Business Energy Rebates Program. Could you give me the name and telephone number of this person? [Probe if respondent is unsure who best to forward the call to. This individual may be an engineer, equipment contractor, or utility account manager].

Name: \_\_\_\_\_

Telephone #: \_\_\_\_\_

(Note: Thank and terminate call. Schedule interview with best contact regarding experience with the program.)

V5. According to our information, through its participation in the Business Energy Rebates Program, your business or organization received a rebate of [TotalRebateAmount] to install energy efficient [CATEGORY FROM SAMPLE] measures in [NUMBER OF SITES FROM SAMPLE] facilities or buildings. When answering the survey questions, please take into account only those Nova Scotia facilities or sites where your company used funds from the Business Energy Rebate program.

## **REASONS FOR PARTICIPATING [P SERIES]**

P1. Did your company or organization participate in any other Nova Scotia Power or Efficiency Nova Scotia programs before the Business Energy Rebates Program?

1. Yes
2. No (Go to P4)
98. (Don't know) (Go to P4)
99. (Refused) (Go to P4)

- P2. [IF P1 = 1] Which programs did your company or organization participate in prior to the Business Energy Rebates Program? **(Please specify program(s). If cannot recall the program names include a short description.)**
- a. \_\_\_\_\_ Program 1
  - b. \_\_\_\_\_ Program 2
  - c. \_\_\_\_\_ Program 3
  - d. \_\_\_\_\_ Program 4
- P3. [REPEAT FOR EACH PROGRAM IDENTIFIED IN P2] In what year did your company or organization participate in [Program x]. **ACCEPT MULTIPLE YEARS**
- 1. Before 2000
  - 2. 2000
  - 3. 2001
  - 4. 2002
  - 5. 2003
  - 6. 2004
  - 7. 2005
  - 8. 2006
  - 9. 2007
  - 10. 2008
  - 11. 2009
  - 12. 2010
  - 13. 2011
  - 98. (Don't know)
  - 99. (Refused)
- P4. How did you learn about the Business Energy Rebates Program? [RANDOMIZE AND READ 1-7, THEN READ CODE 96] **(multiple responses)**
- 1. From Efficiency Nova Scotia literature
  - 2. From Efficiency Nova Scotia presentation
  - 3. From Efficiency Nova Scotia staff person
  - 4. From Efficiency Nova Scotia's website
  - 5. From a contractor or vendor
  - 6. From a business associate or friend (word of mouth)
  - 7. From someone who had previously participated in the Business Energy Rebates Program
  - 96. Or some other way? (Please specify: \_\_\_\_\_)
  - 98. (Don't know)
  - 99. (Refused)

- P5. What was the SINGLE most important reason your company or organization chose to participate in the Business Energy Rebates program? **(DO NOT READ – accept one response)**
1. (to take advantage of program rebates)
  2. (this was part of an already planned project)
  3. (to save on energy costs/bills)
  4. (to reduce maintenance costs)
  5. (to improve existing lighting conditions)
  6. (to find ways to reduce carbon footprint)
  7. (to help protect the environment)
  8. (to replace non-working equipment)
  9. (recommended by utility account rep)
  10. (recommended by a contractor)
  11. (past participation in another utility program)
  96. (Other: Please Specify: \_\_\_\_\_)
  98. (Don't know) (Go to P7)
  99. (Refused) (Go to P7)
- P6. [DO NOT POSE IF 98 OR 99 IN Q.P5] What was SECOND most important reason your company or organization chose to participate in the program? **(DO NOT READ – accept one response – SAME LIST AS P5)**

## **VERIFICATION OF ACTIONS [VA SERIES]**

- VA1. [IF SAMPLE VARIABLE LIGHT = YES] Do you recall installing new lighting as part of the Business Energy Rebates Program?
1. Yes
  2. No (If No: VA1a Are you sure? According to our records you received a rebate of \$[LRebate] from Efficiency Nova Scotia for the installation of new lighting)
  98. (Don't know)
  99. (Refused)

- VA2. [IF SAMPLE VARIABLE MOTOR = YES] Do you recall installing new motors or variable speed drives as part of the Business Energy Rebates Program?
1. Yes
  2. No (If No: VA2a Are you sure? According to our records you received a rebate of \$[MRebate] from Efficiency Nova Scotia for the installation of new motors or variable speed drives)
  98. (Don't know)
  99. (Refused)
- VA3. [IF SAMPLE VARIABLE REF = YES] Do you recall installing refrigeration equipment or upgrades as part of the Business Energy Rebates Program?
1. Yes
  2. No (If No: VA3a Are you sure? According to our records you received a rebate of \$[RRebate] from Efficiency Nova Scotia for the installation of new refrigeration equipment or upgrades speed drives)
  98. (Don't know)
  99. (Refused)
- VA4. [IF SAMPLE VARIABLE AIR = YES] Do you recall installing new compressed air equipment or upgrades as part of the Business Energy Rebates Program?
1. Yes
  2. No (If No: VA4a Are you sure? According to our records you received a rebate of \$[AREbate] from Efficiency Nova Scotia for the installation of new compressed air equipment or upgrades)
  98. (Don't know)
  99. (Refused)
- VA5. [IF SAMPLE VARIABLE HVAC = YES] Do you recall installing new heating, ventilation or air conditioning (HVAC) equipment or upgrades as part of the Business Energy Rebates Program?
1. Yes
  2. No (If No: VA5a Are you sure? According to our records you received a rebate of \$[HRebate] from Efficiency Nova Scotia for the installation of new heating, ventilation or air conditioning (HVAC)equipment or upgrades)
  98. (Don't know)
  99. (Refused)

VA6. Some companies work with a design professional, project architect, engineer, equipment contractor, or a utility account manager as part of the project design phase. Who do you feel was most responsible for specifying the measures to install through the Business Energy Rebates Program? **[RANDOMIZE AND READ]**

1. Outside design professional
2. Contractor
3. Manufacturer representative
4. Utility account manager
5. Someone within your company / organization
96. (Other, please specify:\_\_\_\_\_)
98. (Don't know)
99. (Refused)

**[ASK VA7/VA8 FOR EACH MEASURE CATEGORY VERIFIED IN VA1 – VA5; VA1 = Lighting, VA2 = motors or variable speed drives, VA3 = refrigeration, VA4 = compressed air, VA5 = HVAC; THEN ASK VA9 FIRST TIME THROUGH THEN NOT AGAIN IF THE ANSWER IS NO. IF THE ANSWER IN VA9 IS YES, REPEAT VA7/VA8 FOR EVERY OTHER MEASURE CATEGORY IN SAMPLE THAT HAS BEEN VERIFIED IN VA1-VA5]**

VA7. What ONE factor was most important in motivating your company or organization to install energy efficient [MEASURE CATEGORY] equipment or upgrades? **(DO NOT READ – accept one response)**

VA8. What factor was SECOND most important in motivating your company or organization to install energy efficient [MEASURE CATEGORY] equipment or upgrades? **(DO NOT READ – accept one response)**

1. (to take advantage of program rebates)
2. (this was part of an already planned project)
3. (to save on energy costs/bills)
4. (to reduce maintenance costs)
5. (to improve existing lighting conditions)
6. (to find ways to reduce carbon footprint)
7. (to replace non-working equipment)
8. (recommended by utility account rep)
9. (recommended by a contractor)
10. (past participation in another utility program)
11. (old equipment, replace prior to failure)
12. (part of a building renovation or addition)

- 13. (newly-constructed building)
- 14. (Other: Please Specify: \_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

VA9. [IF MORE THAN ONE MEASURE CATEGORY IN SAMPLE] Were the factors motivating you to install the other energy efficient equipment or upgrades you installed through the Business Energy Rebates Program, different from the reasons you mentioned for [MEASURE 1]?

- 1. Yes – [REPEAT VA7/VA8 FOR EACH CATEGORY]
- 2. No – [CONTINUE]
- 98. (Don't know) – [CONTINUE]
- 99. (Refused) – [CONTINUE]

### **FREE-RIDERSHIP [FR SERIES]**

**[ASK FR1 to FR3 FOR EACH MEASURE CATEGORY VERIFIED IN VA1 –VA5] POSE FR1 TO FR3 IN ORDER**

FR1. Did your company or organization decide to implement the *energy-efficient* [MEASURE CATEGORY] measure before participating in the Business Energy Rebates Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**FR1a. IF FR1= YES, THEN ASK:** I just want to make sure I understand - **Before** you decided to participate in the Efficiency Nova Scotia Business Energy Rebate Program, you had already made the decision to install the *energy efficient* [MEASURE CATEGORY].

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)



**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Business Energy Rebates Program.

If your company or organization had not participated in the Business Energy Rebates Program, what is the likelihood that you would have taken one of the following actions. Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT, In the absence of the Program, would you have . . . : DO NOT ACCEPT A RANGE – POSE FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. ...installed exactly the same energy-efficient [MEASURE CATEGORY] equipment that you installed through the Program?

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR2b. ...installed standard [MEASURE CATEGORY] equipment instead of energy-efficient [MEASURE CATEGORY] equipment?

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

FR2c. ...installed the exactly same energy-efficient [MEASURE CATEGORY] equipment that you installed through the Program *but at a later date*?

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT POSE FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your response to a previous question (FR2c) that if the Business Energy Rebates Program had not been available there was an X in 10 likelihood that you would have installed the same equipment *but at a later date*. Approximately how many months later would you have installed this equipment? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

- 1. \_\_\_\_\_ months later
- 97. (At the same time)
- 98. (Don't Know)
- 99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within...

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3. Efficiency Nova Scotia paid your company or organization \$[REBATE VALUE FROM SAMPLE BY CATEGORY] for the *energy-efficient* [MEASURE CATEGORY] measure. If your company had not received the rebate from Efficiency Nova Scotia, would you have paid for the full cost of the *energy-efficient* [MEASURE CATEGORY], including the portion covered by the rebate? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Paid” and a 10 indicating that you “Definitely **Would Have** Paid.” PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_ Response                      \_\_\_ 98 Don't Know      \_\_\_ 99 Refused

[IF MULTIPLE MEASURE CATEGORIES – RETURN TO TOP OF FR SECTION FOR NEXT MEASURE]

**[ASK QUESTIONS FR4 ONCE FOR ALL MEASURE CATEGORIES IN SAMPLE]**

FR4. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to implement all the *energy-efficient* measures you implemented through the Business Energy Rebates Program. Using a scale from 0 to 10, where 0 means “Not at all important” and 10 means “Extremely important”, please rate the importance of each of the following in your decision to implement the energy-efficient measures you implemented through the Program.

| Factor<br>(READ AND RANDOMIZE)                                                                                                                | Responses                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| a. The Efficiency Nova Scotia rebate(s)                                                                                                       | ___ Response ___98 Don't Know ___99 Refused |
| b. Information received during the initial contact by the program representative.                                                             | ___ Response ___98 Don't Know ___99 Refused |
| c. Information provided through the Business Energy Rebates Program outreach and marketing activities                                         | ___ Response ___98 Don't Know ___99 Refused |
| d. Your company or organization's corporate policy or guidelines regarding the purchase of equipment                                          | ___ Response ___98 Don't Know ___99 Refused |
| e. The standard practice in your industry                                                                                                     | ___ Response ___98 Don't Know ___99 Refused |
| f. Previous experience with the Business Energy Rebates Program, or a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ___ Response ___98 Don't Know ___99 Refused |

## SPILLOVER [SP SERIES]

SP1. Now I'd like you to think about the time since you participated in the Business Energy Rebates Program. Has your company implemented any additional energy-efficient measures on its own in any Nova Scotia location of your company

- 1 Yes
- 2 No
- 98. (Don't know)
- 99. (Refused)

SP2. [IF SP1 = 1 'YES'] When did you implement these additional energy-efficient measures? Was it... READ RESPONSES IN ORDER – CODE ONE ONLY

1. Before participating in the Business Energy Rebates Program [Go to S1]
2. When participating in the Business Energy Rebates Program
3. After participating in the Business Energy Rebates Program
98. (DO NOT READ: Don't know [Go to S1])
99. (DO NOT READ : Refused) [Go to S1]

SP3. [IF SP2 = 2 OR 3] Have the additional energy-efficient measures implemented benefited from any other financing or rebate from any other *Efficiency Nova Scotia* program, or do you plan to submit a funding request for these measures in the future?

1. Yes [Go to S1]
2. No
96. (Don't know [Go to S1])

SP4. [IF SP3 = 2 'NO'] I would like to know what are the additional energy-efficient measures that you have implemented on your own after participating in the Business Energy Rebates Program. Did you implement... *efficient* [MEASURE CATEGORY]

SP4a. Compressed air measures?

1. Yes
2. No
96. (Don't know)

SP4b. Heating, Ventilating and Air conditioning (HVAC) measures?

1. Yes
2. No
96. (Don't know)

SP4c. Lighting measures?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4d. Motors and drives measures?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4e. Refrigeration measures?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4f. Other energy-efficient measures?

- 1. Yes
- 2. No
- 98. (Don't know)

SP5. [IF SP3 = 2 'NO'] How influential was your experience with the energy-efficient measures implemented through the Business Energy Rebates Program on your decision to implement some or all of these additional energy-efficient measures on your own? Please give your answer on a scale of 0 to 10, where 0 indicates that the Business Energy Rebates Program "had no influence at all on your decision to implement additional energy-efficient measures" and 10 indicates that the program was "extremely influential in your decision to implement additional energy-efficient measures." **[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

## **SATISFACTION [S SERIES]**

- S1. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how was your company or organization's experience with each OF THE FOLLOWING aspects of the Business Energy Rebates Program. If your company / organization did not have experience with one of the aspects please tell me. [DO NOT RANDOMIZE] [97 = Not Applicable, 98 = Don't know, 99 = Refused] DO NOT ACCEPT A RANGE
1. Program application, forms and associated paperwork
  2. Interaction and communication with staff
  3. Availability of Efficiency Nova Scotia staff
  4. Initial confirmation of eligibility
  5. Rebate or incentive amounts
  6. Time required to receive rebate or incentive
  7. The program overall
- S2. On a scale of 1 to 5, where 1='not at all likely' and 5='very likely', how likely will your company or organization be to purchase energy efficient products, including but not limited to energy efficient lighting, when installing or replacing energy-using products for your business in the future? [9=Don't know/Don't recall]

## **BARRIERS TO ACTIONS & RECOMMENDATIONS FOR IMPROVEMENTS [B SERIES]**

- B1. Were there any challenges or barriers that you faced in implementing the energy efficient measures for which you received a rebate from the Business Energy Rebates Program?
1. Yes
  2. No **(SKIP TO B4)**
  98. (Don't know) **(SKIP TO B4)**
  99. (Refused) **(SKIP TO B4)**
- B2. What was the SINGLE most important barrier? **(DO NOT READ - ACCEPT ONE RESPONSE)**
1. (concern that actual bill savings would be less than estimated)
  2. (lack of information to make an informed decision)
  3. (rebate/incentive was too little)
  4. (paperwork/process required too much work)

5. (too little information about the program)
6. (cost savings not worth the effort of applying)
7. (approval takes too long)
8. (lack of financing)
9. (energy efficient equipment does not meet payback requirements)
10. (decision made elsewhere)
11. (do not own building – have to work through owner)
12. (lack of technical knowledge)
13. (lack of time / too busy)
14. (focused on core business)
96. (Other – SPECIFY: \_\_\_\_\_)
98. (Don't know) (Go to B4)
99. (Refused) (Go to B4)

- B3. What was the **SECOND** most important barrier? **(DO NOT READ - ACCEPT ONE RESPONSE – SAME LIST AS B2)**
- B4. On a scale of 1 to 5, where 1= 'not at all important' and 5 = 'very important', how important is **reducing energy usage** to your company/organization? **[98 = Don't know, 99 = Refused]**
- B5. On a scale of 1 to 5, where 1= 'not at all important' and 5 = 'very important', how important is **managing energy costs** to your company/organization? **[98 = Don't know, 99 = Refused]**
- B6. Approximately what percent of your annual operating budget do energy costs account for?  
**[998 = Don't know, 999 = Refused] PROBE TO RECEIVE A SPECIFIC RESPONSE, AND ACCEPT A RANGE ONLY IF NECESSARY**  
  
\_\_\_\_\_ %
- B7. Do you have any suggestions on how to improve the Business Energy Rebates Program? Consider all aspects of the program: process, measures covered, marketing, interactions with utility staff, and program forms. **PROBE: Anything else?**
- B8. Would a figure illustrating the various steps to follow in order to participate in the Business Energy Rebates Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?

1.    \_\_\_      Significantly
2.    \_\_\_      Somewhat
3.    \_\_\_      Slightly, or
4.    \_\_\_      Not at all
- 96    (Depends on what the figure or illustration would have been)
97.    (This kind of document already exists)
98.    (Don't know)
99.    (Refused)

## **FIRMOGRAPHICS [F SERIES]**

- F1.    What is the main activity of your company? [DO NOT READ—BUT CONFIRM WITH RESPONDENT THAT THE CATEGORY YOU CHOOSE IS CORRECT]
1.    Education
  2.    Food Sales (grocery)
  3.    Food Service (restaurant)
  4.    Health Care - Inpatient
  5.    Health Care - Outpatient
  6.    Lodging
  7.    Mercantile— Retail (Enclosed and Strip Malls)
  8.    Mercantile – Retail (Other than Mall)
  9.    Office
  10.   Public Assembly
  11.   Public Order and Safety
  12.   Religious Worship
  13.   Service
  14.   Warehouse / storage
  15.   Manufacturing (Identify Industry Type \_\_\_\_\_)
  16.   (e.g., chemical, food, paper, etc.) Other? \_\_\_\_\_
  17.   Vacant
  18.   Other (SPECIFY: \_\_\_\_\_)
  98.   (Don't know)
  99.   (Refused)



F3. Approximately how many full-time equivalent workers DOES YOUR COMPANY OR ORGANIZATION employ at all locations within Nova Scotia?

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or more
98. (Don't know)
99. (Refused)

F4. We want to estimate the number of operating hours of your business.

F4a. On average, how many hours per day is your business open?  
[RECORD NUMBER OF HOURS 0-24, ACCEPT DECIMAL] [97=It varies/depends, 98 = Don't know/don't recall, 99 = Refused]

F4b. How many days per week is your business open?  
[RECORD NUMBER OF DAYS 0-7, ACCEPT DECIMAL] [97=It varies/depends, 98 = Don't know/don't recall, 99 = Refused]

F4c. And how many weeks per year is your business open?  
[RECORD NUMBER OF WEEKS 0-52, ACCEPT DECIMAL] [97= It varies/depends, 98 = Don't know/don't recall, 99 = Refused]

F5. Is your company independent, or part of a larger company?

1. Independent
2. Part of a larger company
96. Other (\_\_\_\_\_)
98. (Don't know)
99. (Refused)

F6. How many business locations does your organization have in Nova Scotia? **[RECORD A NUMBER 1-99; 998 = Don't know, 999 = Refused]**

END.

Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## APPENDIX VI – ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Econoler site number: \_\_\_\_\_

Business Name: \_\_\_\_\_

Site contact Name: \_\_\_\_\_

Person met during site visit: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

Is the facility a new construction? \_\_\_\_\_

Type of building:

|                       |                          |                             |                          |                           |                          |
|-----------------------|--------------------------|-----------------------------|--------------------------|---------------------------|--------------------------|
| Retail:               | <input type="checkbox"/> | Manufacturing / Industrial: | <input type="checkbox"/> | Grocery / Supermarket:    | <input type="checkbox"/> |
| College / University: | <input type="checkbox"/> | Multi-unit res.:            | <input type="checkbox"/> | Other ( <i>Specify</i> ): | <input type="checkbox"/> |

## 2 BUILDING HEATING/COOLING SYSTEM DESCRIPTION

Heating Source:

*Please fill the table below for each heating source at the site*

|                                  | Heating system 1 | Heating system 2 | Heating system 3 | Heating system 4 |
|----------------------------------|------------------|------------------|------------------|------------------|
| Heat source                      |                  |                  |                  |                  |
| Heating system type              |                  |                  |                  |                  |
| Heating system efficiency or COP |                  |                  |                  |                  |

Cooling system:

*Please fill the table below for each cooling source at the site*

|                            | Cooling system 1 | Cooling system 2 | Cooling system 3 | Cooling system 4 |
|----------------------------|------------------|------------------|------------------|------------------|
| Cooling system type        |                  |                  |                  |                  |
| Cooling system SEER or COP |                  |                  |                  |                  |

## 3 FACILITY OPERATION HOURS AND LIGHTING USAGE

*Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

Facility occupancy schedule:

| Occupancy schedule                                                        | 1: Normal |         | 2 (specify): |         | 3 (specify): |         |
|---------------------------------------------------------------------------|-----------|---------|--------------|---------|--------------|---------|
|                                                                           | Weekdays  | Weekend | Weekdays     | Weekend | Weekdays     | Weekend |
| Number of day with regular schedule per year                              |           |         |              |         |              |         |
| Number of day with regular holidays schedule per year                     |           | ----    |              | ----    |              | ----    |
| Number of days with no occupancy per year (For example: seasonal closure) |           |         |              |         |              |         |
| Total number of day per year                                              | 261       | 104     | 261          | 104     | 261          | 104     |

Normal week/holidays  
lighting operation schedule  
(hours per day):

*Please fill the table below for each lighting schedule reported by the site contact as usage could vary for each section of the facility. Use additional sheets if necessary.*

| Schedule # | Lighting schedule                               | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|-------------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours<br>(for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 2          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 3          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |

## 4 MEASURES INFORMATION

### Lighting

Date of installation (*From database*):

---

Date of installation (*Contact declaration*):

---

Hours of use for equipment [h/day] (*From database*):

---

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

---

Hours of use for equipment: *Indicate the corresponding annual hours:*

---

Is cooling installed in the section with the lighting measure? (*Contact declaration and on-site verification*).

☐ Yes

% time with lights and cooling ON:

Cooling system info (*Indicate number corresponding to the system in this section*):

☐ No

Is heating installed in the section with the measure?

☐ Yes

% time with lights and heating ON:

Heating system info (*Indicate number corresponding to the system in this section*):

☐ No

The percentage of lighting that remains on when the facility is closed:

---

Validate if lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

---

When was the lamp removed or when did it burn?

---

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

---

Type of lighting measures installed on site

*Use table below to record the information. For each type of equipment, indicate the number of equipment with a specific wattage. Use additional sheets if required.*

| New equipment installed                          |               |                 |                |                 |                                                                                                                                       | Baseline equipment |               |                     |               |                     |                        |
|--------------------------------------------------|---------------|-----------------|----------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------------|---------------|---------------------|------------------------|
| Type                                             | Number        |                 | Wattage        |                 | Additional information                                                                                                                | Type               | Number        |                     | Wattage       |                     | Additional information |
|                                                  | From database | Site validation | From database  | Site validation |                                                                                                                                       |                    | From database | Contact declaration | From database | Contact declaration |                        |
| Hard-wired CFL                                   |               |                 |                |                 | Is the product hard-wired with electronic ballast?<br><br>Is the product for exit signs, replacement lamps or retrofit kit (specify)? |                    |               |                     |               |                     |                        |
| LED screw-in/pin-based lamps/bulbs and Downlight |               |                 |                |                 | Is product ENERGYSTAR® rated? If not available, collect product number.                                                               |                    |               |                     |               |                     |                        |
| LED Strip Lights                                 | ft            | ft              | Wt/ft or total | Wt/ft or total  | Is product ENERGYSTAR® rated? If not available, collect product number.                                                               |                    |               |                     |               |                     |                        |
| LED streetlight / parking light                  |               |                 |                |                 | Collect product number                                                                                                                |                    |               |                     |               |                     |                        |

| New equipment installed                 |               |                 |               |                 |                                                                                                                                                              | Existing equipment |               |                     |               |                     |                                                            |
|-----------------------------------------|---------------|-----------------|---------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------------|---------------|---------------------|------------------------------------------------------------|
| Type                                    | Number        |                 | Wattage       |                 | Additional information                                                                                                                                       | Type               | Number        |                     | Wattage       |                     | Additional information                                     |
|                                         | From database | Site validation | From database | Site validation |                                                                                                                                                              |                    | From database | Contact declaration | From database | Contact declaration |                                                            |
| LED traffic/pedestrian signals          |               |                 |               |                 | Does the product meet the ENERGYSTAR® and Institute for transportation engineer specification for traffic signals? If not available, collect product number. |                    |               |                     |               |                     |                                                            |
| Reduced – Wattage Metal Halide Lamp     |               |                 |               |                 |                                                                                                                                                              |                    |               |                     |               |                     | 175 W or greater?<br>400 W or greater?                     |
| Ceramic Metal Halide                    |               |                 |               |                 |                                                                                                                                                              |                    |               |                     |               |                     | Is it a halogen lamp?<br><br>Is it a Ceramic Metal Halide? |
| Pulse Start Metal Halide Fixture        |               |                 | -             |                 |                                                                                                                                                              |                    |               |                     |               |                     | Was a HPS or Metal Halide Fixture installed?               |
| Electronic Ballast Metal Halide Fixture |               |                 | -             |                 | Is HPS or Metal Halide Fixture installed?                                                                                                                    |                    |               |                     |               |                     |                                                            |

| New equipment installed                     |               |                 |               |                 |                                                                                                                                                            | Existing equipment |               |                     |               |                     |                                                                |
|---------------------------------------------|---------------|-----------------|---------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------------|---------------|---------------------|----------------------------------------------------------------|
| Type                                        | Number        |                 | Wattage       |                 | Additional information                                                                                                                                     | Type               | Number        |                     | Wattage       |                     | Additional information                                         |
|                                             | From database | Site validation | From database | Site validation |                                                                                                                                                            |                    | From database | Contact declaration | From database | Contact declaration |                                                                |
| Induction Lamp Fixture                      |               |                 | -             |                 | Is product CSA/cUL rated?                                                                                                                                  |                    |               |                     |               |                     |                                                                |
| T5 High-Bay (20' ceiling or higher) Fixture |               |                 | -             |                 | Is a T5HO lamp/ballast system used?<br><br>Is an electronic ballast installed?<br><br>How many lamps are installed per fixture?                            |                    |               |                     |               |                     |                                                                |
| T8 High-Bay (20' ceiling or higher) Fixture |               |                 | -             |                 | Are high-performance T8 or reduced wattage T8 lamps installed?<br><br>Is an electronic ballast installed?<br><br>How many lamps are installed per fixture? |                    |               |                     |               |                     |                                                                |
| LED exit sign illuminated LED Lamps         |               |                 | -             |                 | Does it meet UL 924?                                                                                                                                       |                    |               |                     |               |                     | Is it an incandescent or fluorescent exit sign?                |
| Photoluminescent exit signs                 |               |                 | -             |                 | Is product ENERGYSTAR® rated?                                                                                                                              |                    |               |                     |               |                     | Is the existing lamp an incandescent or fluorescent exit sign? |



| VSD                                                                                                                                                                                                                                                                                                     |                                                        |       |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------|-------|
| Date of installation ( <i>From database</i> ):                                                                                                                                                                                                                                                          | <hr/>                                                  |       |       |
| Date of installation ( <i>Contact declaration</i> ):                                                                                                                                                                                                                                                    | <hr/>                                                  |       |       |
| Total number of equipment installed – <i>From database</i> :                                                                                                                                                                                                                                            | <hr/>                                                  |       |       |
| Total number of equipment installed – <i>Site validation</i> :                                                                                                                                                                                                                                          | <hr/>                                                  |       |       |
| <i>Use additional sheets if required</i>                                                                                                                                                                                                                                                                | VSD 1                                                  | VSD 2 | VSD 3 |
| Is the VSD still operational? If not, why and since when?                                                                                                                                                                                                                                               | <hr/>                                                  | <hr/> | <hr/> |
| VSD is new and not replacing an existing VSD (Yes/No)                                                                                                                                                                                                                                                   | <hr/>                                                  | <hr/> | <hr/> |
| VSD automatically controlled (Y/N). If yes, specify the type of control (DP, flow or T°):                                                                                                                                                                                                               | <hr/>                                                  | <hr/> | <hr/> |
| Is the VSD an electronic or mechanical design?                                                                                                                                                                                                                                                          | <hr/>                                                  | <hr/> | <hr/> |
| Collect product number                                                                                                                                                                                                                                                                                  | <hr/>                                                  | <hr/> | <hr/> |
| Collect product manufacturer                                                                                                                                                                                                                                                                            | <hr/>                                                  | <hr/> | <hr/> |
| What is the application for the VSD ( <i>Supply fan, Return fan, Exhaust fan, Chilled water pump, Heating hot water circulation pump, Forward-curve fan with inlet guide vanes, Variable pitch vane-axial fans, and Circulation pumps with integral variable speed technology or other (Specify)</i> )? | <hr/>                                                  | <hr/> | <hr/> |
| VSD size – <i>From Database</i> :                                                                                                                                                                                                                                                                       | <hr/>                                                  | <hr/> | <hr/> |
| VSD size (3 HP, 5 HP, 7,5 HP, 10 HP or other: specify) – <i>From site validation</i> :                                                                                                                                                                                                                  | <hr/>                                                  | <hr/> | <hr/> |
| Hours of use for equipment: <i>Indicate the corresponding schedule number for each section</i> :                                                                                                                                                                                                        | <hr/>                                                  | <hr/> | <hr/> |
| Hours of use for equipment: <i>Indicate the corresponding annual hours</i> :                                                                                                                                                                                                                            | <hr/>                                                  | <hr/> | <hr/> |
| Load profile – <i>Contact declaration</i>                                                                                                                                                                                                                                                               | <hr/> <i>Use table below to record the information</i> |       |       |

| <b>Load profile (kWh or flow: circle the appropriate one)</b> |     |     |     |     |     |     |     |     |     |      |
|---------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Full load percent                                             | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| % yearly hours at each load                                   |     |     |     |     |     |     |     |     |     |      |

## HVAC

|                                                                                       |        |        |        |        |        |        |
|---------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|
| Date of installation ( <i>From database</i> ):                                        | <hr/>  |        |        |        |        |        |
| Date of installation ( <i>Contact declaration</i> ):                                  | <hr/>  |        |        |        |        |        |
| Total number of unit installed on site - <i>From database</i> :                       | <hr/>  |        |        |        |        |        |
| Total number of unit installed on site – <i>From site validation</i> :                | <hr/>  |        |        |        |        |        |
| <i>Use additional sheets if required</i>                                              | HVAC 1 | HVAC 2 | HVAC 3 | HVAC 4 | HVAC 5 | HVAC 6 |
| Validate the equipment number in database                                             | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Is the equipment still used? If no, why, and since when?                              | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Type of equipment installed ( <i>A/C or heat pump</i> ) – <i>From database</i> :      | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Type of equipment installed ( <i>A/C or heat pump</i> ) – <i>On site validation</i> : | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Original Heat source (electricity or other: specify) – <i>Contact declaration</i> :   | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Equipment cooling capacity (Btu/hr) – <i>From database</i> :                          | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |
| Equipment cooling capacity (Btu/hr) – <i>On site validation</i> :                     | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  | <hr/>  |

|                                                                                                                               |       |       |       |       |       |       |
|-------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|
| Equipment heating capacity, if a heat pump is installed (Btu/hr) – <i>From database:</i>                                      | _____ | _____ | _____ | _____ | _____ | _____ |
| Equipment heating capacity, if a heat pump is installed (Btu/hr) – <i>On site validation:</i>                                 | _____ | _____ | _____ | _____ | _____ | _____ |
| Equipment SEER – <i>From database:</i>                                                                                        | _____ | _____ | _____ | _____ | _____ | _____ |
| Equipment SEER – <i>On site validation:</i>                                                                                   | _____ | _____ | _____ | _____ | _____ | _____ |
| Equipment HSPF – <i>From database:</i>                                                                                        | _____ | _____ | _____ | _____ | _____ | _____ |
| Equipment HSPF – <i>On site validation:</i>                                                                                   | _____ | _____ | _____ | _____ | _____ | _____ |
| Total yearly cooling equivalent full load hours – <i>From database:</i>                                                       | _____ | _____ | _____ | _____ | _____ | _____ |
| Total yearly cooling equivalent full load hours (if known, if not ask for yearly cooling hours) – <i>Contact declaration:</i> | _____ | _____ | _____ | _____ | _____ | _____ |
| Total yearly heating equivalent full load hours (from database):                                                              | _____ | _____ | _____ | _____ | _____ | _____ |
| Total yearly heating equivalent full load hours (if known, if not ask for yearly heating hours):                              | _____ | _____ | _____ | _____ | _____ | _____ |
| Hours of use for equipment: <i>Indicate the corresponding schedule number for each section:</i>                               | _____ | _____ | _____ | _____ | _____ | _____ |
| Number of days a week when HVAC system is used from 5 pm to 7 pm:                                                             | _____ | _____ | _____ | _____ | _____ | _____ |

### Occupancy sensors

Date of installation (*From database*):


Date of installation (*Contact declaration*):

Is the equipment still used? If not, which percentage is operating? When did the change occur?

Number of units installed (*From database*):


Number of units installed (*On site validation*):

Are the products CSA or cUL rated (Indicate which)?

Type – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*On site validation*):


Number – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*On site validation*):


Wattage of lamps controlled by (*From database*):


Wattage of lamps controlled by OCC (*On site validation*):


Daily operation hours before OCC (*From database*):


Daily operation hours before OCC (*Contact declaration*)

*Please fill the table below for each section with OCC*

| Schedule # | Lighting schedule                               | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|-------------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours<br>(for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |

Hours of use per year with OCC (*From database*)


Hours of use for equipment: *Indicate the corresponding schedule number*

Hours of use for equipment: *Indicate the corresponding annual hours:*

---

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

---

Indicate the corresponding cooling system number for each section (*Site validation/Contact declaration*):

---

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

---

Indicate the corresponding heating system number for each section (*Site validation/Contact declaration*):

---

## Refrigeration

Date of installation (*From database*):

---

Date of installation (*Contact declaration*):

---

Is the equipment still used? If not, why and since when?

---

Type of equipment installed – From database:

---

Type of equipment installed – On site validation

---

Material of equipment installed (PVC, metal or other: specify)

---

Is the product installed on a multi-deck cooler?

---

Length installed – From database:

---

Length installed – On site validation:

---

Hours of use per year (*From database*)

---

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

---

Hours of use for equipment: *Indicate the corresponding annual hours*

---

Refrigeration system EER – *Contact declaration:*

---

Temperature of the application, i.e. inside the refrigerator (*Contact declaration/Site validation*):

---

If possible, take a picture of the measure installed.

---

## COMMENTS OR NOTES

## APPENDIX VII – ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Business Energy Rebates Program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level.

|                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did your company decide to implement the energy-efficient measure ?                                                                                                                                                                                                                                | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to install the energy efficient measure?                                                                                                                                                                              | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%<br>IF PRE-SCREENING FR1 = 0%                                                                                                       |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient equipment that you installed through the program? (Scale 0 to 10)                                                                                                                                                | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have installed standard equipment instead of energy-efficient equipment? (Scale 0 to 10)                                                                                                                                                                          | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                   | <b>MEAN VALUE OF<br/>(FR2a ; FR2b)<br/>IF PRE-SCREENING: 0%</b>                                                                                                                  |
| <b>FR3.</b> If your company had not received the rebate offered by the program, would you have paid for the full cost of the energy-efficient measures, including the portion covered by the rebate? (Scale 0 to 10)                                                                                                                                | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                   | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3</b>                                                                                                                             |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c and f = Program factors<br>Factors d and e = Non Program factors                                                                                                                                                                                                                  | FR4_P = SUM(a; b; c; f)<br>FR4_NP = SUM(d; e)                                                                                                                                    |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                   | <b>100% -<br/>[FR4_P/(FR4_P+FR4_NP)]</b>                                                                                                                                         |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient equipment <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                                            | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have installed this equipment ?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                   | <b>IF PRE-SCREENING: FR2cc/2<br/>OTHERWISE: FR2cc</b>                                                                                                                            |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                         | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                |



Subsequently, the final free-ridership level calculated for each participant was submitted to an inconsistency test:

- > The inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to  $FR3$  represented an inconsistency and  $PA2$  was removed from the final free-ridership calculation. Otherwise,  $PA2$  remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.



**ECONOLER**

# **SMART LIGHTING CHOICES PROGRAM IMPACT EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 impact evaluation of the Smart Lighting Choices (SLC) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM) and 10 distributors as well as on 10 on-site visits.

## **PROGRAM OVERVIEW**

The SLC program provides financial incentives, in the form of prescriptive rebates, to participating distributors across Nova Scotia to encourage them to stock and sell qualifying products to non-residential facilities.

The prescribed products are divided into two categories:

- > T8 lamps:
  - 32 W high-performance T8 (HPT8) lamps (HPT8-32W)
  - 28 W reduced-wattage T8 lamps (RW-T8-28W)
  - 25 W reduced-wattage T8 lamps (RW-T8-25W); and
- > HPT8 ballasts.

The program is both a resource acquisition and a market transformation program operating in a market that is partially transformed for high-performance T8 lamps and HPT8 ballasts. The program is expected to last until regulatory agencies implement regulations to sustain the market transformation.

The 2011 impact evaluation also considered purchases made through the Upstream Business Energy Rebates (UBER) sub-program, which was in effect from September 1, 2011 to December 31, 2011. This component was a sub-program of the Business Energy Rebates (BER) program and provided prescriptive rebates to participating distributors across Nova Scotia. The UBER sub-program was evaluated under the SLC program since both used an upstream approach and targeted the same distributors. The following categories of products were covered by this sub-program:

- > light-emitting diode (LED) downlights;
- > LED wall packs;
- > T5 high bay fixtures;
- > T8 high bay fixtures;
- > occupancy sensors;
- > electronically commutated motors;
- > heating ventilation and air conditioning hotel occupancy sensors;
- > LED strip lighting for refrigeration;
- > dual enthalpy economizer controls; and
- > traffic signals.

The SLC program aimed at achieving net electricity savings of 8.04 GWh in 2011.

## KEY FINDINGS

The 2011 evaluation of the SLC program demonstrated that the latter is well designed and has a good potential of success. For the year 2011, the program totalled sales of 423,176 T8 lamps and 137,637 HPT8 ballasts, which is an increase compared to last year (378,812 T8 lamps and 115,808 HPT8 ballasts). Additionally, 1,732 products were purchased through the UBER sub-program. In terms of net energy savings, the program generated 7.954 GWh, which represents an increase in comparison to 2010 net savings (6.24 GWh). This value includes savings for the UBER sub-program.

### Program Energy Savings

To calculate the net savings of the SLC program in 2011, Econoler reviewed the gross savings estimated by ENSC using results from the on-site visits and included interactive effects for lighting products. Moreover, 10 distributor interviews were conducted to evaluate free-ridership levels for the program. Through this approach, a free-ridership level of 19 percent was captured for the program.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | 2011 |
|----------------------|------|
| Free-Ridership Level | 19%  |
| Net-to-Gross Ratio   | 0.81 |

The evaluation revealed that the SLC program had generated net energy savings of 7.954 GWh and demand savings of 2.050 MW at the generator in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                                                                                                                                                                                                                    | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR*       | Net Savings      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|------------------|
| <b>Energy Savings</b>                                                                                                                                                                                              |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC                                                                                                                                                                                          | 9.261 GWh             | 9.261 GWh               | 9.261 GWh                                        | 0.83        | 7.730 GWh        |
| <b>Evaluation Results</b>                                                                                                                                                                                          | <b>10.513 GWh</b>     | <b>10.513 GWh</b>       | <b>9.703 GWh</b>                                 | <b>0.82</b> | <b>7.954 GWh</b> |
| <b>Demand Savings</b>                                                                                                                                                                                              |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC                                                                                                                                                                                          | 2.717 MW              | 2.717 MW                | 2.717 MW                                         | 0.83        | 2.267 MW         |
| <b>Evaluation Results</b>                                                                                                                                                                                          | <b>2.708 MW</b>       | <b>2.708 MW</b>         | <b>2.499 MW</b>                                  | <b>0.82</b> | <b>2.050 MW</b>  |
| * NTGRs of 0.84 for the SLC program and of 0.75 for the UBER sub-program were used for tracked savings while NTGRs of 0.81 for the SLC program and of 1 for the UBER sub-program were used for program evaluation. |                       |                         |                                                  |             |                  |

The net energy savings values calculated were compared with the tracked savings for 2011. The values calculated were slightly higher than the values tracked. This can be explained by the increase in hours of operation that was applied to energy savings calculations for SLC products. This increase was sufficient to overcome the reduction in energy savings caused by the interactive effects factor of -7.7 percent applied to the gross savings, and by the difference between the NTGR calculated for the SLC program and the one applied by the PM to tracked savings. The NTGR used for tracked savings was 0.84 for T8 lamps and HPT8 ballasts, compared to the 0.81 figure used for the evaluation.

## RECOMMENDATIONS

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following recommendations that aim at optimizing specific aspects of the program:

- SLC-R1. Improve the quality of distributors' invoices and develop a tracking sheet that monitors program savings for the whole year:** Several formats are used in the invoices provided by distributors. These invoices do not feature the same type of information. Fields are also not filled in systematically in numerous instances. A template indicating the information required for program monitoring should be provided to all distributors and would facilitate the consolidation of the different invoices received. Moreover, ENSC should consider establishing a 100 percent approval threshold for the invoice fill rate and request that all distributors indicate the type of product sold for each purchase. This would facilitate



savings calculations based on the invoices received. Lastly, the PM should develop a tracking sheet that allows monitoring savings for the whole year instead of completing individual monthly reports as is currently the case.

- SLC-R2. Collect additional information through telephone surveys conducted with commercial and industrial (C&I) customers:** ENSC should investigate retrofit activities involving de-lamping during its telephone survey campaigns with C&I customers. This will provide information on the use of de-lamping as well as on the proportion of customers who purchase high-performance T8 lamps as a result of de-lamping projects. Additionally, information on T8 to T8 replacements could be collected from these customers. Such replacements would reduce program energy savings. In order to better evaluate the interactive effects factors, information on the heating source and on the use of air conditioning should also be collected during the surveys with C&I customers.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Efficiency Nova Scotia Corporation (ENSC) Smart Lighting Choices (SLC) program is both a resource acquisition and a market transformation program operating in a market that is partially transformed for high-performance T8 (HPT8) lamps and HPT8 ballasts. The program provides financial incentives for qualifying products through prescriptive rebates to participating distributors across Nova Scotia. The SLC program targets non-residential facilities.

ENSC started managing the program in October 2010 and has continued it throughout 2011. The program is expected to last until regulatory agencies implement regulations to sustain the market transformation.

Additionally, this report covers purchases made through the Upstream Business Energy Rebates (UBER) sub-program. This program was launched on September 1, 2011 and continued through to December 31, 2011. It was a sub-program of the Business Energy Rebates (BER) program. The UBER sub-program provides prescriptive rebates to participating distributors across Nova Scotia. It was evaluated under the SLC program since both use an upstream approach and target mostly the same distributors.

### **Program Objectives**

The goals of this program are to:

- > encourage distributors in the province of Nova Scotia to stock and sell HPT8 lamps and HPT8 ballasts;
- > increase the market penetration of energy-efficient products in retrofit and new construction projects; and
- > transform the market by raising the efficiency of standard practices.

Through these goals, the program aimed at achieving net electricity savings of 8.04 GWh in 2011. In 2010, the SLC program generated net energy savings of 6.24 GWh.

### **Eligible Products**

Under the SLC program, the prescribed products were divided into the following two categories:

- > T8 lamps:
  - 32 W high-performance T8 lamps (HPT8-32W)
  - 28 W reduced-wattage T8 lamps (RW-T8-28W)
  - 25 W reduced-wattage T8 lamps (RW-T8-25W); and
- > HPT8 ballasts.

A \$0.75 rebate is offered to participating distributors for each lamp sold, while a \$3 rebate is offered for each HPT8 ballast sold. This rebate must be reflected in the price of the product. In addition, distributors receive \$0.25 for each lamp or ballast sold to compensate for administrative costs related to rebate administration and reporting to ENSC.

For the UBER sub-program, several motors, drives, heating, ventilation and air conditioning (HVAC) systems and lighting products were eligible for a rebate. The categories of eligible products and the applicable rebates are presented in the table below.

**Table 3: List of Eligible Products and Incentive Amount**

| Category of Eligible Products                                                 | Incentive Amount                                                                                                               |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Light-Emitting Diode (LED) Downlights                                         | Flat \$15 rebate                                                                                                               |
| LED Wall Packs                                                                | Flat \$100 rebate                                                                                                              |
| T5 High Bay Fixtures                                                          | Flat \$60 rebate                                                                                                               |
| T8 High Bay Fixtures                                                          | Flat \$45 rebate                                                                                                               |
| Occupancy Sensors                                                             | 45% of listed price or \$40, whichever is lower                                                                                |
| Electronically Commutated Motors                                              | 45% of listed price or \$60, whichever is lower, for HP<1/20.<br>45% of listed price or \$180 for, whichever is lower, HP>1/20 |
| HVAC Hotel Occupancy Sensor (without building integrated intelligent control) | Flat \$75 rebate                                                                                                               |
| HVAC Hotel Occupancy Sensor (with building integrated intelligent control)    | Flat \$150 rebate                                                                                                              |
| LED Strip Lighting for Refrigeration                                          | \$10/foot rebate                                                                                                               |
| Dual Enthalpy Economizer Controls                                             | Flat \$250 rebate                                                                                                              |
| Traffic Signals                                                               | RED/Green - \$60 each/Yellow - \$30                                                                                            |

## **Participating Distributors**

As of November 2011, the ten distributors listed below are participating in the SLC program; two additions have been made to the eight listed in the program manual released in July 2011:

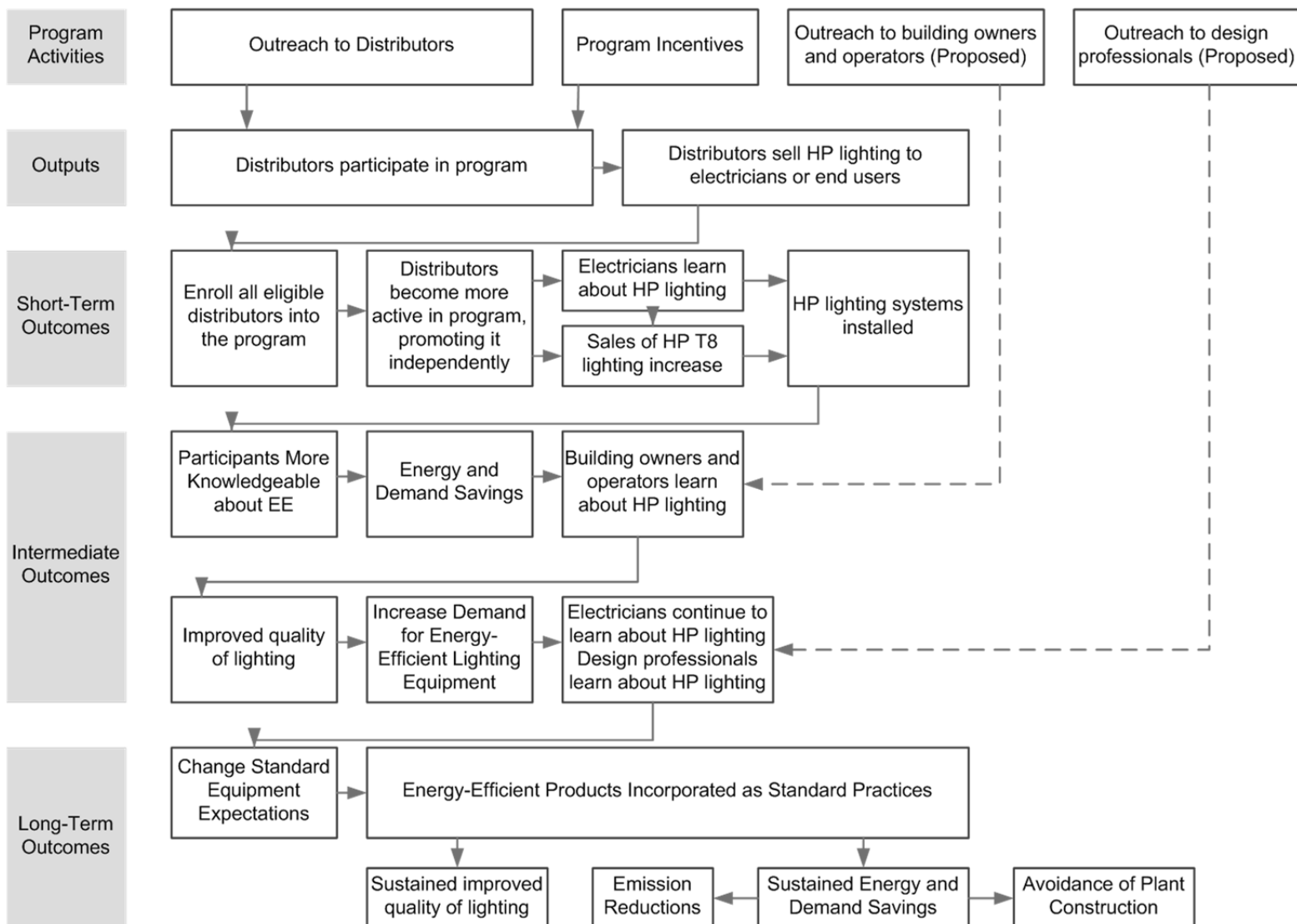
- > Island Distributors Ltd.;
- > Nedco;
- > Liteco Inc.;
- > Eddy Group;
- > Graybar Electric Company Inc.;
- > Litemor Distributors Ltd.;
- > Guillevin International Co.;
- > WESCO International Inc.;
- > Source Atlantic Limited; and
- > JW Bird and Company Limited.

The distributors mentioned above participated in the UBER sub-program for the year 2011, except for Island Distributors and Bird Stairs.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Smart Lighting Choices Program Logic Model**

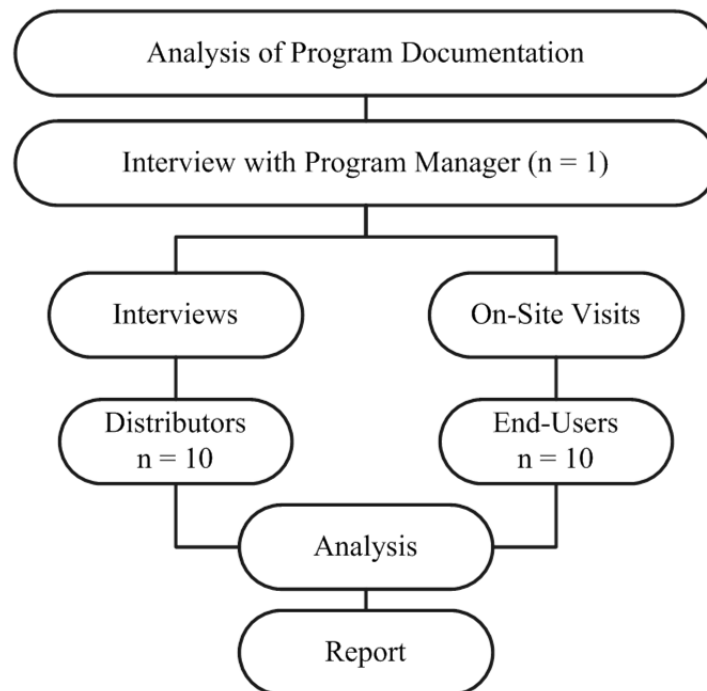


## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

The 2011 evaluation of the SLC program included an impact evaluation through which program energy savings were assessed. For 2011, the SLC program did not require a process evaluation because such an exercise had been conducted in 2010 and since then, no major changes in the program delivery model had occurred. The next figure illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides are included in Appendices II and III.

**Figure 2: Methodological Model**



## **2.2 METHODOLOGY DESCRIPTION**

### **2.2.1 Analyzing Existing Program Information**

The first task in the evaluation of the SLC program was the analysis of the program documentation. At this stage, all available program information was reviewed. The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;
- > 2010 evaluation report;
- > program manual;
- > distributor invoices.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler staff conducted one interview in September with the Program Manager (PM). The interview covered a variety of program-related topics. Below are some of the elements examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners; and
- > prior evaluation recommendations.

### **2.2.3 In-Depth Interviews with Distributors**

In October and November, 10 in-depth interviews were conducted with the participating distributors. In some cases, with a view to ensuring a more accurate picture of a given company, more than one employee was interviewed as part of a single distributor interview. These interviews were mainly used to establish free-ridership. The questions were meant to estimate how the market would have reacted without the program.

#### **2.2.4 On-Site Visits**

In November, ten on-site visits were conducted at facilities in which SLC products had been installed. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These site visits were used to validate the installation of products in accordance with the data found in the tracking sheet (number of products installed and their characteristics) as well as hours of operation through an interview with a site energy manager.

The methodology used for the on-site visits for the SLC program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix IV.



### **3 PROGRAM TRACKING SHEET**

A tracking sheet is not used to monitor savings for the SLC program. However, invoices provided by distributors and monthly reporting sheets developed by the PM were reviewed.

Econoler reviewed the content of some of the invoices received by ENSC from distributors. In general, the invoices are used by the PM to monitor the sales of eligible products through the program. Distributors send their invoices, with the quantities of products sold, to ENSC. Subsequently, on a monthly basis, the PM generates a monthly reporting sheet based on such information, which in turn is used to monitor the quantity of products sold by each distributor and to calculate related savings. To that effect, a tracking sheet covering the year 2011 was provided to the Evaluator for review.

The invoices are sent by each participating distributor monthly. Most files received are in an Excel spreadsheet format, allowing for easy compilation. However, for one distributor, files arrive in a PDF format, making compilation with other files difficult. All customer information necessary to conduct on-site visits is present on the invoices. However, several fields in the invoices are not always filled by distributors. The PM requires that at least 80 percent of all cells be filled for an invoice to be approved for claim payment. These cells include information on the type of installation (new or retrofit), the product code, the number of units, the date of sale, the invoice number or purchase order, the civic address and postal code as well as the telephone number of the purchaser. However, the analysis of the invoices revealed that this is not always the case. Several invoices were missing more than 20 percent of values for the fields listed above. Nevertheless, these invoices were approved by the PM. The missing information might not be essential for program administration but is useful for evaluation purposes.

For each sale, the information in the invoice is entered by the distributor based on transaction details and the purchaser's declaration. However, the type of product purchased and its characteristics are not specified (the lamp wattage or the type of ballast). These details can be obtained using the product number, but are not directly available on the invoice. To complete the tracking sheet, the PM uses the product number indicated on the invoice to determine the type and wattage of the product sold. The tracking sheet provided by the PM lists the total number of units sold for each type of product. The demand and energy savings are calculated using unitary savings wattage values and a standard value for hours of operation. A unitary savings value is used for each type of T8 lamp and each type of HPT8 ballast sold.

In conclusion, all the necessary fields for the administration of the rebates are present on the invoices. The invoices also provide useful information for evaluation purposes, such as information on the customer. However, several adjustments could be made in the future to improve the consistency of the invoices, monitor program savings on a continuous basis and improve program evaluation. The Evaluator recommends that ENSC:

- > **Develop a tracking sheet that monitors program savings for the whole year:** The data from the invoices could be used to track the quantity of products sold along with program savings for the whole year. The PM could use the information to monitor its program operation and estimate the savings generated for the whole year. At the moment, savings estimation is completed on a monthly basis by ENSC through individual monthly reports.
- > **Provide distributors with a template listing the information required for each sale:** The different invoices received showed that distributors do not use the same format to enter data in their files and that very often different types of information are encountered in the same field. For example, the facility field contains several types of entry ranging from the actual facility type to the contractor's name and even the facility address. Moreover, not all distributors include the same type of information in their tracking sheets. For instance, some distributors neither include information on the end-user nor do they provide a detailed address for each sale. A template indicating the information required and the format desired would facilitate the consolidation of the different invoices received. It would also provide distributors with a better understanding of the data needed for the program. This would facilitate the quality control process on the tracking sheets to ensure that the required data is submitted. Finally, it would make the transfer of information into the general tracking sheet easier.
- > **Make sure that all fields are filled in systematically:** Once an invoice template is established, it is recommended that all fields are systematically filled in. ENSC indicated that in order for an invoice to be approved, a minimum proportion of 80 percent of the fields must be completed on the invoice. However, numerous invoices do not provide the information required, thereby not meeting the 80 percent approval threshold. Moreover, since these fields are required for program evaluation, the PM should consider a 100 percent approval threshold.
- > **Facilitate the tracking of products by requesting that distributors include the type of product purchased for each category:** Currently, the only information available on a product is the category of product (lamp or ballast) and the product number. The PM has to use the product number and link it to the exact type of product and its characteristics (the lamp wattage or the type of ballast). If this information is available to distributors in their system, they should be asked to include it directly on their invoices. Thus, it would be easier for the PM to calculate savings directly from the information on the invoice.

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > savings calculation methodology for each type of product;
- > hours of operation;
- > installation rate;
- > diversity factor;
- > interactive effects; and
- > free-ridership.

The impact evaluation was based on a review of the distributors' sales reports, ten on-site visits and ten distributor interviews.

Every month, the PM generates a tracking sheet based on these invoices, which in turn is used to monitor the quantity of products sold by each distributor and calculate related savings. The methodology used to calculate these savings was reviewed.

As recommended in the Savings Verification Study relative to the 2010 DSM programs, on-site visits were performed for each category of products sold under the SLC program. The on-site visits were used to verify the type of technology installed at participants' facilities as well as to collect information on hours of operation based on self-declaration from the site contact. Information on the space heating source and on heating, ventilation and air conditioning (HVAC) equipment was also obtained during the on-site visits. The data collected during this activity was used to establish installation rates, hours of operation and interactive effects on program demand and energy savings. The gross energy savings evaluation is the result of data collection and savings adjustments.

The distributor interviews provided information to calculate the net-to-gross ratio (NTGR) for this program, based solely on free-ridership. The NTGR established was used to calculate the program net savings.

## 4.2 ON-SITE VISIT SAMPLING AND PROTOCOL

### Sampling Methodology

The tracking sheet received for 2011 contained the total monthly sales for T8 lamps and HPT8 ballasts. A total of 423,176 lamps and 137,637 ballasts were purchased from seven distributors through the program. Three out of the 10 distributors participating in the program did not report any sale for the year 2011.

For each category of products, five site visits were conducted. In order to select the desired sites for the visits, transactions were separated into two strata based on the number of units sold per order for each category of products. The first stratum included transactions with less than 100 units while the second stratum included transactions with 100 units and above. The table below presents the quantities for each type of product at the time of sampling, as well as the number of site visits for each stratum.

**Table 4: Size of Ballast and Lamp Transactions at the Time of Sampling**

|                                       | Ballasts                                       |                                              | Lamps                                          |                                              |
|---------------------------------------|------------------------------------------------|----------------------------------------------|------------------------------------------------|----------------------------------------------|
|                                       | Stratum 1: Less than 100 Units per Transaction | Stratum 2: 100 Units or More per Transaction | Stratum 1: Less than 100 Units per Transaction | Stratum 2: 100 Units or More per Transaction |
| Number of Transactions                | 6,334                                          | 117                                          | 2,109                                          | 619                                          |
| Total Number of Units in Each Stratum | 59,993                                         | 20,884                                       | 61,301                                         | 170,729                                      |
| % of Total Units                      | 74.2%                                          | 25.8%                                        | 26.4%                                          | 73.6%                                        |
| Number of Site Visits                 | 3                                              | 2                                            | 2                                              | 3                                            |

A list of preferred regions located close to larger regional centres was established for site selection. The following areas were considered:

- > Halifax;
- > Dartmouth;
- > Sydney and North Sydney;
- > Coldbrook and Kentville; and
- > Pictou County.

## **On-Site Visit Protocol**

An on-site visit protocol listing the information to be collected was developed for each site, including the type, wattage and number of old products and new products installed. Furthermore, information on the facility's heating and cooling equipment and usage, and on the hours of operation, based on the site contact declaration.

The detailed on-site visit protocol is presented in Appendix IV.

## **4.3 GROSS SAVINGS**

The gross savings estimation was computed based on the total number of products sold, on a review of the savings calculations and on the data collected during on-site visits. The information provided by the PM included the number of products sold for each category through the program, the type of products sold (including wattage or number of lamps per unit for ballasts) and the total savings for the program.

Products eligible for the SLC rebate were also eligible for incentives through the Small Business Energy Solutions (SBES) and the Commercial & Industrial Custom (C&IC) programs. To avoid double counting, the SLC program savings calculation took into account the portion of products rebated through the SLC program and one of these two programs. The PM collected information from distributors on products rebated through the SBES and the C&IC programs. This information indicated that 80 percent of the HPT8 lamp and HPT8 ballast products purchased through the SBES and C&IC program were products rebated through the SLC program. The total number of products considered for savings calculations took into account these deductions. Excluding purchases made through the SBES and C&IC programs, a total of 257,897 lamps and 75,083 ballasts were considered for energy and demand savings calculations.

### **4.3.1 Unitary Savings Calculation Review**

As presented before, there were two types of categories eligible for rebates through the SLC program: T8 lamps and HPT8 ballasts.

For each of type of product in these categories, a unitary savings value was established by the PM. These unitary savings values were used to calculate the program savings in the tracking sheet.

#### **T8 Lamps (RW-T8 and HPT8)**

For lamp savings, the unitary wattage is the wattage difference between the baseline product (a T12-34 W lamp) and the lamp purchased. This method of savings calculation is appropriate for reduced-

wattage and high-performance T8 lamps. The unitary savings used for this program are presented in the table below. The values used by the PM are considered adequate and were not modified for this evaluation.

**Table 5: T8 Lamps Savings**

| Type of T8 Lamps | Unitary Wattage Value (W) |
|------------------|---------------------------|
| HPT8-32 W        | 34 W – 32 W = 2 W         |
| RW-T8-28 W       | 34 W – 28 W = 6 W         |
| RW-T8-25 W       | 34 W – 25 W = 9 W         |

HPT8 lamps are characterized by a higher lumen production per watt compared to standard T8 lamps. The National Center for Appropriate Technology (NCAT) indicates a 2,474 lumens value for a 34 W T12 lamp<sup>1</sup>, whereas the Consortium for Energy Efficiency indicates a minimum requirement of 3,100 lumens for T8 lamps to qualify as high-performance<sup>2</sup>. This suggests that customers may do some de-lamping when purchasing HPT8 lamps. For instance, a system with three HPT8-32 W lamps could be used to retrofit a system with four T12-34 W lamps. However, this hypothesis has to be validated before taking into account the additional savings resulting from de-lamping. Therefore, Econoler recommends that retrofit activities involving de-lamping be investigated during the next evaluation. This could be completed during the survey campaigns conducted by ENSC targeting commercial and institutional (C&I) customers.

## HPT8 Ballasts

For ballasts, the unitary savings used by the PM were established based on total ballast savings and the number of units sold for each type of ballast in 2010. The methodology used to calculate ballast savings in 2010 involves calculating the difference between the wattage of a magnetic ballast with T12-34 W lamps and an HPT8 ballast with different types of lamps, excluding savings associated with lamp replacements. The equation below was used to estimate the unitary savings for each type of ballast.

$$\text{Unitary Ballast Wattage Savings (W)} =$$

<sup>1</sup> NCAT, Standard Wattage Table with Lumens, <http://www.ncat.org/energy/Standard%20Wattage%20Table%20with%20Lumens.pdf> (website visited on November 21, 2011).

<sup>2</sup> CEE, High Performance T8 Specification, <http://www.cee1.org/com-com-lt/com-lt-specs.pdf> (website visited on November 21, 2011).

*(Baseline ballast and lamp W – New ballast and lamp W) –*

*(Unitary W Savings for the Lamp × Number of lamps per ballast)*

The next table presents baseline and new equipment wattage values as well as the unitary savings calculated for each type of product. For old magnetic ballasts, a ballast factor value ranging from 1.26 to 1.06 is used depending on the number of lamps, while values ranging from 0.84 to 0.86 are used for new HPT8 ballasts.

**Table 6: HPT8 Ballast Unitary Savings**

| <b>New Ballast and Lamp Systems</b>   | <b>Baseline Wattage (W)</b> | <b>New Equipment Wattage (W)</b> | <b>Lamp Savings (W)</b> | <b>Unitary Savings for Ballasts – Used for Evaluation (W)</b> | <b>Unitary Savings for Ballasts – from Tracking Sheet (W)</b> |
|---------------------------------------|-----------------------------|----------------------------------|-------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| 1-lamp ballast with HPT8-32 W lamp    | 43.0                        | 27.0                             | 2.0                     | 14.0                                                          | 13.5                                                          |
| 1-lamp ballast with RW-T8-28 W lamp   | 43.0                        | 24.0                             | 6.0                     | 13.0                                                          |                                                               |
| 1-lamp ballast with RW-T8-25 W lamp   | 43.0                        | 21.0                             | 9.0                     | 13.0                                                          |                                                               |
| 2-lamp ballasts with HPT8-32 W lamps  | 72.0                        | 54.0                             | 4.0                     | 14.0                                                          | 13.5                                                          |
| 2-lamp ballasts with RW-T8-28 W lamps | 72.0                        | 47.0                             | 12.0                    | 13.0                                                          |                                                               |
| 2-lamp ballasts with RW-T8-25 W lamps | 72.0                        | 42.0                             | 18.0                    | 12.0                                                          |                                                               |
| 3-lamp ballasts with HPT8-32 W lamps  | 112.0                       | 80.0                             | 6.0                     | 26.0                                                          | 22.4                                                          |
| 3-lamp ballasts with RW-T8-28 W lamps | 112.0                       | 71.0                             | 18.0                    | 23.0                                                          |                                                               |
| 3-lamp ballasts with RW-T8-25 W lamps | 112.0                       | 63.0                             | 27.0                    | 22.0                                                          |                                                               |
| 4-lamp ballasts with HPT8-32 W lamps  | 144.0                       | 107.0                            | 8.0                     | 29.0                                                          | 27.4                                                          |
| 4-lamp ballasts with RW-T8-28 W lamps | 144.0                       | 94.0                             | 24.0                    | 26.0                                                          |                                                               |
| 4-lamp ballasts with RW-T8-25 W lamps | 144.0                       | 84.0                             | 36.0                    | 24.0                                                          |                                                               |

The average unitary savings for each type of ballast system, for example a 1-lamp ballast system, is then calculated using the weighted average of savings for the different types of lamps with the proportion of each type of lamps purchased through the SLC program. For instance, the equation below illustrates the calculation of the average unitary savings of a 1-lamp T8 ballast.

$$\begin{aligned}
 \text{Savings}_{1\text{-lamp-T8 ballast}} = & \\
 & \text{Savings}_{1\text{-lamp-T8 ballast-32W}} \times \text{Percentage}_{\text{HPT8 lamps sold}} + \\
 & \text{Savings}_{1\text{-lamp-T8 ballast-28W}} \times \text{Percentage}_{\text{RWT8 28W lamps sold}} + \\
 & \text{Savings}_{1\text{-lamp-T8 ballast-25W}} \times \text{Percentage}_{\text{RW 25 W lamps sold}}
 \end{aligned}$$

This approach is appropriate for calculating program savings. However, the percentage of each type of lamp is not the same from one year to the next. In 2011, the following percentages were obtained:

- > 0.41 percent of all lamp sales were RW-T8-25W;
- > 47.54 percent of all lamp sales were RW-T8-28W; and
- > 52.05 percent of all lamp sales were HPT8-32W.

Thus, the unitary savings for each type of ballasts were recalculated using the percentage of each type of lamps sold for 2011. The table below presents the revised unitary savings value for each type of ballasts.

**Table 7: HPT8 Ballast Savings for 2011 Evaluation and from Tracking Sheet**

| Type of Ballast | Revised Unitary Savings Value (W) | Unitary Savings for Ballasts – from Tracking Sheet (W) |
|-----------------|-----------------------------------|--------------------------------------------------------|
| 1 lamp ballast  | 13.5                              | 13.5                                                   |
| 2 lamps ballast | 13.5                              | 14.5                                                   |
| 3 lamps ballast | 24.6                              | 22.4                                                   |
| 4 lamps ballast | 27.6                              | 27.4                                                   |



### 4.3.2 UBER Sub-Program

For 2011, a total of 1,732 products were purchased through the UBER sub-program. The table below presents the total sales for each category of products. No product was purchased in the other categories covered by the UBER sub-program.

**Table 8: UBER Product Sales**

| Category of Products | Number of Products Sold |
|----------------------|-------------------------|
| LED Downlights       | 555                     |
| LED Wall Packs       | 784                     |
| T5 High Bay Fixtures | 134                     |
| T8 High Bay Fixtures | 45                      |
| Occupancy Sensors    | 214                     |

For each of these products, unitary savings values were calculated by the PM using the approach developed for the BER program. Savings values for the BER program were, for the most part, based on the Efficiency Vermont 2006 technical reference manual (TRM). These savings values were not revised as part of the evaluation since the approach used in the TRM was deemed appropriate.

### 4.3.3 Hours of Operation for the SLC program

For the SLC program, energy savings were calculated using a value of 3,400 hours of operation per year for all projects. This assumption of hours per year corresponded to the weighted average of the hours of operation used for the SBES and C&IC programs in 2010, as indicated in the 2010 program evaluation. This value was consistent with the average annual operating hours by business type from the Efficiency Vermont TRM. The hours of operation presented by Efficiency Vermont were obtained from a report published in 1993 by Orange and Rockland Utilities.

For this evaluation, the 3,400 value was compared to the hours of operation declared by participants during on-site visits and to values obtained from other jurisdictions.

During on-site visits, participants reported an average of 3,900 hours of operation per year. This value was obtained by collecting the detail schedule for fluorescent lighting bulbs purchased through the SLC program. This information was collected for several building sections of 10 sites. Moreover, the

OPA Quasi-Prescriptive Measures and Assumptions report<sup>3</sup> details the hours of operation for several types of buildings in the commercial and institutional categories for its T8 Light Fixtures program component. The average value for all type of buildings is 3,893 hours per year. The hours of operation presented by the OPA were obtained from the Database on Energy Efficient Resources 2008 Update (Summary of Measure Energy Analysis Revisions) published by the California Public Utility Commission and the California Energy Commission. For the 2011 evaluation, the average value of 3,893 hours per year obtained from the OPA report was used since it came from a more recent source. Moreover, the average hours of operation value from the OPA was in line with the value obtained from on-site visits.

#### **4.3.4 Installation Rate**

As part of the evaluation, information on the number of products was collected during on-site visits. These visits were conducted at end-users' facilities. However, in most cases, lamp and ballast purchases were made by an electrician for subsequent installation at the end-user's facility. This resulted in end-users not having the most accurate information on where products were installed and on the possibility of some of the products being stored or installed at other locations.

In most cases, end-users could not validate the information extracted from distributors' invoices. This resulted in the information collected on site not being accurate enough to establish an installation ratio for the program.

For the SLC program, an installation rate of 100 percent was used for T8 lamps and HPT8 ballasts since the information collected on site did not allow for an accurate calculation.

#### **4.3.5 T8 to T8 Replacement Ratio**

For T8 lamps, unitary savings are based on replacement of T12. However, purchases could also be made through the program to replace T8 lamps. In such a case, unitary savings would be reduced. Econoler recommends using a telephone survey to investigate this matter further by asking end-users if they replaced old T8 lamps with T8 lamps rebated through the program. If this situation is observed in the market, future evaluations will need to take it into account and use a T8 to T8 replacement ratio to decrease the gross savings.

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<sup>3</sup> Ontario Power Authority (OPA), "2011 Quasi Prescriptive Measures and Assumptions,"  
<http://www.powerauthority.on.ca/evaluation-measurement-and-verification/measures-assumptions-lists>.

#### **4.3.6 Diversity Factor**

Based on the information received from NSPI, the peak electricity demand for Nova Scotia Power typically occurs between 5 p.m. and 7 p.m. on a non-holiday weekday in winter. In order to evaluate demand savings that coincide with the NSPI system peak, hours of operation were investigated for all the sites visited during the process evaluation. For each site, the percentage of total demand savings occurring during the peak demand period was established based on the facility schedule. These values were used to establish the diversity factor for the SLC program. A diversity factor of 73 percent was obtained for the year 2011.

#### **4.3.7 Revised Gross Savings**

Energy and demand savings for the program were corrected to reflect the adjustments on the unitary wattage value, the hours of operation, the installation rate and the diversity factor. Savings at the generator level were also calculated using a line loss factor of 1.062 between the meter and the generator. This value was calculated using the weighted average of the line loss factor for each category of commercial and industrial customers, with the total customer sales of the corresponding projects. The line loss factor values were provided by Nova Scotia Power for each rate code.

The total savings obtained for each product are presented in Table 9. For the SLC program, gross energy savings amount to 9.384 GWh at the meter and 9.966 GWh at the generator. For the UBER sub-program, gross energy savings amount to 0.515 GWh at the meter and 0.547 at the generator. The total gross demand savings are estimated at 2.409 MW at the meter and at 2.559 MW at the generator for the SLC program. For the UBER sub-program, savings are estimated at 0.140 MW at the meter and at 0.149 MW at the generator.

**Table 9: Evaluation Results – Gross Energy and Demand Savings**

| Product Category                                           | Lamp Replacements – SLC Program |                |              | HPT8 Ballasts – SLC Program |               |              |               | UBER Sub-program |
|------------------------------------------------------------|---------------------------------|----------------|--------------|-----------------------------|---------------|--------------|---------------|------------------|
|                                                            | HPT8-32W                        | RW-T8-28 W     | RW-T8-25 W   | 1-Lamp                      | 2-Lamp        | 3-Lamp       | 4-Lamp        |                  |
| <b>Number of Units</b>                                     |                                 |                |              |                             |               |              |               |                  |
| <b>Number of Units in the Program Tracking Sheet</b>       | 134,241                         | 122,592        | 1,064        | 4,899                       | 43,547        | 4,680        | 22,677        | 1,732            |
| Installation Rate                                          | 100.0%                          | 100.0%         | 100.0%       | 100.0%                      | 100.0%        | 100.0%       | 100.0%        | 100.0%           |
| <b>Total Number of Units</b>                               | <b>134,241</b>                  | <b>122,592</b> | <b>1,064</b> | <b>4,899</b>                | <b>43,547</b> | <b>4,680</b> | <b>22,677</b> | <b>1,732</b>     |
| <b>Evaluated Energy Savings</b>                            |                                 |                |              |                             |               |              |               |                  |
| Unitary Savings (kWh)                                      | 7.8                             | 23.4           | 35.0         | 52.6                        | 52.6          | 95.8         | 107.4         | -                |
| <b>Total Gross Energy Savings - at Meter (GWh)</b>         | <b>1.047</b>                    | <b>2.869</b>   | <b>0.037</b> | <b>0.257</b>                | <b>2.289</b>  | <b>0.448</b> | <b>2.437</b>  | <b>0.515</b>     |
| Line Loss Factor                                           | 1.062                           | 1.062          | 1.062        | 1.062                       | 1.062         | 1.062        | 1.062         | 1.062            |
| <b>Total Gross Energy Savings - at Generator (GWh)</b>     | <b>1.112</b>                    | <b>3.047</b>   | <b>0.039</b> | <b>0.273</b>                | <b>2.431</b>  | <b>0.476</b> | <b>2.588</b>  | <b>0.547</b>     |
| <b>Evaluated Demand Savings</b>                            |                                 |                |              |                             |               |              |               |                  |
| Unitary Savings (W)                                        | 2.0                             | 6.0            | 9.0          | 13.5                        | 13.5          | 24.6         | 27.6          | -                |
| <b>Total Gross Demand Savings - at Meter (MW)</b>          | <b>0.268</b>                    | <b>0.736</b>   | <b>0.010</b> | <b>0.066</b>                | <b>0.588</b>  | <b>0.115</b> | <b>0.626</b>  | <b>0.140</b>     |
| Diversity Factor                                           | 73%                             | 73%            | 73%          | 73%                         | 73%           | 73%          | 73%           | 73%              |
| <b>Total Gross Peak Demand Savings - at Meter (MW)</b>     | <b>0.196</b>                    | <b>0.537</b>   | <b>0.007</b> | <b>0.048</b>                | <b>0.429</b>  | <b>0.084</b> | <b>0.457</b>  | <b>0.102</b>     |
| Line Loss Factor                                           | 1.062                           | 1.062          | 1.062        | 1.062                       | 1.062         | 1.062        | 1.062         | 1.062            |
| <b>Total Gross Demand Savings - at Generator (MW)</b>      | <b>0.285</b>                    | <b>0.782</b>   | <b>0.011</b> | <b>0.070</b>                | <b>0.624</b>  | <b>0.122</b> | <b>0.665</b>  | <b>0.149</b>     |
| <b>Total Gross Peak Demand Savings - at Generator (MW)</b> | <b>0.208</b>                    | <b>0.570</b>   | <b>0.007</b> | <b>0.051</b>                | <b>0.456</b>  | <b>0.089</b> | <b>0.485</b>  | <b>0.108</b>     |

## 4.4 INTERACTIVE EFFECTS

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling systems. In the case of the SLC and UBER sub-programs, replacement of regular lighting products with efficient lighting products causes an increase in the heating load during winter and a decrease in the cooling load during summer.

An interactive effects factor of -7.7 percent was used in this evaluation. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work conducted in this study was intended to modify certain parameters in building simulations of commercial buildings in Quebec in order to determine the impact of these changes on heating and cooling systems. The simulations were performed with the DOE2 software and only focused on buildings heated entirely by electricity.

The following table presents the calculation details for the interactive effects. The values presented take into account the proportion of commercial buildings that are electrically heated and the proportion that are air conditioned. These proportions were obtained from the on-site visits conducted for all commercial and industrial (C&I) programs, except for the Commercial and Industrial Custom and Efficient Products-Direct Install programs. Data from the latter were excluded since the information collected on heating and cooling systems during the on-site visits for these programs were not representative of C&I facilities. Commercial and Industrial Custom program participants include a significant proportion of industrial customers, rendering the information collected difficult to use for other commercial and industrial programs. Sites with electric heating systems were over-represented in the sample used for EP-DI on-site visits. Information for a total of 34 sites was collected to establish the interactive effects factor. For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&I telephone survey campaigns conducted by ENSC. This would provide for a better evaluation of the interactive effects factor.

**Table 10: Interactive Effects Factor for Lighting Products**

| Parameters                                   | % Commercial Buildings | Interactive Effects <sup>4</sup> |
|----------------------------------------------|------------------------|----------------------------------|
| Electric heating with air conditioning       | 14.71%                 | -43.4%                           |
| Electric heating without air conditioning    | 8.82%                  | -49.0%                           |
| No electric heating with air conditioning    | 52.94%                 | 5.7%                             |
| No electric heating without air conditioning | 23.53%                 | 0.0%                             |
| <b>Weighted Interactive Effect Factor</b>    | <b>-</b>               | <b>-7.7%</b>                     |

<sup>4</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

## **4.5 NET-TO-GROSS RATIO**

For the SLC program, the NTGR evaluation of the program is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on end-users' decisions to purchase program-eligible efficient lighting products. These questions were included in the distributor interview and were specific to the two categories of products promoted through the program: high-performance and reduced wattage T8 lamps and HPT8 ballasts.

This section details the methodology used to transform responses obtained through in-depth interview questions into a NTGR. For the SLC program, the NTGR includes the assessment of one distortion effect: free-ridership. Once this effect is quantified, the NTGR is calculated based on this equation:

$$\text{Net-to-gross ratio} = (1 - \% \text{ free-ridership}).$$

### **4.5.1 Free-Ridership**

In the program, free-ridership can occur when distributors declare that end-users would still have purchased the efficient lighting products in the absence of the program. The telephone interviews with distributors included questions to estimate:

- > the program influence (on a scale from 0 to 10) on their customers' decision to purchase energy-efficient lighting products; and
- > the percentage of products that would have been sold in the absence of the program.

To answer these questions, the distributors were asked to think about all the influences that the program had had on the market. They focused on the incentives offered by the program and on the program influence on their product stock in comparison with provinces that had not benefited from the program. They also focused on consumer awareness towards efficient lighting products.

The results were then transposed into a level of free-ridership for each category of products. The final free-ridership value for the program was obtained by calculating the weighted average of the free-ridership with the corresponding total energy savings, for each category of products.

Using this approach, in-depth interview results revealed a level of free-ridership of 19 percent for the SLC program. This means that the ENSC program influenced 81 percent of the sales of high performance T8 lamps and HPT8 ballasts in 2011, the remaining 19 percent being attributed to the natural trend. In fact, the interviews showed that the program had had a significant influence on the distributors' product stock, which modified their product selection in order to include a greater selection of high performance products. One distributor even indicated that only HPT8 ballasts were now sold at their stores. This is an indication that the SLC program is pushing the offer towards high performance T8 lamps and ballasts. On the other hand, other sources of influence, such as the natural evolution of technology and the green building trend, exist on the market. These factors explain the 19 percent of

free-ridership, which represents a slight increase compared with the overall level of free-ridership obtained during the last evaluation (16 percent).

Using the free-ridership level established, the NTGR for the SLC program is 0.81. For the UBER sub-program, a NTGR of 1 was used since this program included relatively expensive lighting products that had only recently been introduced in the market.

## 4.6 NET SAVINGS

The net savings for the program were estimated using the NTGR value obtained above. The equation below was used to calculate the program net savings.

$$\text{Net savings} = \text{gross evaluation savings} \times (1 + \text{interactive effects factor}) \times \text{NTGR}$$

This equation was used for both demand and energy savings. The results obtained are presented in Table 11. For 2011, the total net energy savings at the generator level are estimated at 7.954 GWh while net demand savings at the generator are estimated at 2.050 MW.

**Table 11: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR*       | Net Savings      |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 9.261 GWh             | 9.261 GWh               | 9.261 GWh                                        | 0.83        | 7.730 GWh        |
| <b>Evaluation Results</b> | <b>10.513 GWh</b>     | <b>10.513 GWh</b>       | <b>9.703 GWh</b>                                 | <b>0.82</b> | <b>7.954 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                  |
| Tracked Savings from ENSC | 2.717 MW              | 2.717 MW                | 2.717 MW                                         | 0.83        | 2.267 MW         |
| <b>Evaluation Results</b> | <b>2.708 MW</b>       | <b>2.708 MW</b>         | <b>2.499 MW</b>                                  | <b>0.82</b> | <b>2.050 MW</b>  |

\* NTGRs of 0.84 for the SLC program and of 0.75 for the UBER sub-program were used for tracked savings while NTGRs of 0.81 for the SLC program and of 1 for the UBER sub-program were used for program evaluation.

The net energy savings values calculated were compared with the tracked savings for 2011. The values calculated were slightly higher than the values tracked. This can be explained by the increase in hours of operation that was applied to energy savings calculations for SLC products. This increase was sufficient to overcome the reduction of energy savings caused by the interactive effects factor of - 7.7 percent applied to the gross savings, and by the difference between the NTGR calculated for the SLC program and the one applied by the PM to tracked savings. The NTGR used for tracked savings was 0.84 for T8 lamps and HPT8 ballasts, compared to 0.81 used for the evaluation.



## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b> | <p><b>1. Develop a tracking sheet that monitors program savings for the whole year:</b> The data from the invoices could be used to track the quantity of products sold along with program savings for the whole year. The PM could use the information to monitor its program operation and estimate the savings generated for the whole year. At the moment, savings estimation is completed on a monthly basis by ENSC through individual monthly reports.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                               | <p><b>2. Provide distributors with a template listing the information required for each sale:</b> The different invoices received showed that distributors do not use the same format to enter data in their files and that very often different types of information are encountered in the same field. For example, the facility field contains several types of entry ranging from the actual facility type to the contractor's name and even the facility address. Moreover, not all distributors include the same type of information in their tracking sheets. For instance, some distributors neither include information on the end-user nor do they provide a detailed address for each sale. A template indicating the information required and the format desired would facilitate the consolidation of the different invoices received. It would also provide distributors with a better understanding of the data needed for the program. This would facilitate the quality control process on the tracking sheets to ensure that the required data is submitted. Finally, it would make the transfer of information into the general tracking sheet easier.</p> |
|                               | <p><b>3. Make sure that all fields are filled in systematically:</b> Once an invoice template is established, it is recommended that all fields are systematically filled in. ENSC indicated that in order for an invoice to be approved, a minimum proportion of 80 percent of the fields must be completed on the invoice. However, numerous invoices do not provide the information required, thereby not meeting the 80 percent approval threshold. Moreover, since these fields are required for program evaluation, the PM should consider a 100 percent approval threshold.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b> | <p><b>4. Facilitate the tracking of products by requesting that distributors include the type of product purchased for each category:</b> Currently, the only information available on a product is the category of product (lamp or ballast) and the product number. The PM has to use the product number and link it to the exact type of product and its characteristics (the lamp wattage or the type of ballast). If this information is available to distributors in their system, they should be asked to include it directly on their invoices. Thus, it would be easier for the PM to calculate savings directly from the information on the invoice.</p> |
| <b>Impact Evaluation</b>      | <p><b>5. Investigate retrofit activities involving de-lamping:</b> Econoler recommends that retrofit activities involving de-lamping be investigated during the next evaluation. This could be completed during the survey campaigns conducted by ENSC targeting commercial and institutional (C&amp;I) customers.</p>                                                                                                                                                                                                                                                                                                                                             |
|                               | <p><b>6. Use a telephone survey to investigate T8 to T8 replacements:</b> Econoler recommends using a telephone survey to investigate this matter further by asking end-users if they replaced old T8 lamps with T8 lamps rebated through the program. If this situation is observed in the market, future evaluations will need to take it into account and use a T8 to T8 replacement ratio to decrease the gross savings.</p>                                                                                                                                                                                                                                   |
|                               | <p><b>7. Collect information on heating source and on the use of air conditioning equipment during the C&amp;I telephone survey campaigns:</b> For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&amp;I telephone survey campaigns conducted by ENSC. This would provide for a better evaluation of the interactive effects factor.</p>                                                                                                                                                                                    |

## **APPENDIX II - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Partial Process Evaluation**

#### **Program Name: Smart Lighting Choices**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

Even though, the evaluator mandate did not include a process evaluation, we have a few questions to help us better understand some elements of the program.

|                                |
|--------------------------------|
| <b>Source: Evaluation 2010</b> |
|--------------------------------|

#### **Page 5**

Q: When is the legislation expected to be enacted?

Q: We understand that this is a markdown type of program and that the beneficiaries are not identified. Correct?

C: Since the base line would be the standard T12/T8 lights, it would be important to monitor production, stocks and sales of these two items before legislation to avoid "Technology Dumping" in the Province.

#### **Page 6**

Q: In the program assumption, second bullet, what is your position on that concern (cost savings are not passed to the end consumer)?

C: Since the end users are unknown (beside large customers) sales records of a previous year from retailer could give an identification of the program impact in the market.

|                    |
|--------------------|
| <b>Source: Web</b> |
|--------------------|

Q: When referring to the CEE Web Site, which section(s) applies to the participant exactly?

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

**Page 4**

Q: Point 5.1 # 6 is the name of purchaser or end user. Is this new?

Q: Is it for all or any number of purchased lamps?

Q: Did the retailers agreed to that?

C: Page 8

C: The process flow chart is a very good tool and should be present in every program.

Q: We haven't seen any participation or reporting form in the program's numerous Information sources? Is there one.

C: Finally, It would be recommended to separate, in the program manual, the sections that concern participants from retailers from the sections concerning ENSC.

Thank you very much for your time and cooperation.

## **APPENDIX III - INTERVIEW GUIDE WITH DISTRIBUTORS**

### **DISTRIBUTOR INTERVIEW GUIDE ENSC SMART LIGHTING CHOICES PROGRAM**

November 1, 2011

Hello, may I please speak with \_\_\_\_\_?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

#### **INTRODUCTION**

Hello, my name is \_\_\_\_\_, from Econoler. I am calling on behalf of Efficiency Nova Scotia Corporation for the Smart Lighting Choices Program.

#### **IDENTIFICATION AND SCREENING OF RESPONDENT**

- I1. According to our records, your company/store has participated in the Smart Lighting Choices Program from Efficiency Nova Scotia. Econoler has been mandated by Efficiency Nova Scotia to conduct an evaluation of this program. We have a few questions about your company/store's participation in this program. Specifically, I'd like to speak with someone in your company/store who is knowledgeable about the stocking and supplying of products that were rebated by the program. These products are high-performance and low (reduced) wattage T8 lamps as well as HPT8 ballasts. Would that person be you?

\_Person responsible available [CONTINUE TO I2]

\_Person responsible currently unavailable [ARRANGE CALL BACK WITH THE RIGHT PERSON]

\_No person responsible for stocking or management of products [CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT - CONTINUE TO I2]

\_Don't know [CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT - CONTINUE TO I2]

\_Refused [THANK AND TERMINATE]

#### **Confidentiality**

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses.

### **Recording of the Interview**

Please note that the interview will be recorded. The recording will remain strictly confidential. It is simply a tool for me because I cannot write all the information that you will give me.

I2. What is your job title?

-----

### **ASK IF HIGH-PERFORMANCE OR LOW WATTAGE T8 LAMPS WERE REBATED THROUGH THE PROGRAM**

#### **High-performance or low wattage T8 lamps**

I have a few questions about your sales of high-performance and low (reduced) wattage T8 lamps.

Our records indicate that your total sales of high performance and low wattage T8 lamps up to August 2011 amount to \_\_\_\_\_ products. Furthermore, your sales for 2010 amounted to \_\_\_\_\_ products.

Ask if there is a significant difference (plus or minus 25%) between sales in 2011 (expected) and 2010.

T1. If the current trend is maintained, your total sales for high-performance and low wattage T8 lamps in 2011 will be significantly lower/higher (*select the appropriate term*) than for the previous year. Is there any reason for this change?

[PROBE: market trend, more competitors offering these products, etc.]

T2. In 2011, the Smart Lighting Choices Program provided an incentive of \$75 for each high-performance as well as for each low wattage T8 lamp sold in your store(s). If this incentive had not been available, do you think that your 2011 sales of high-performance and low wattage T8 lamps would have been about the same or lower?

1. Same [GO TO T3]
2. Lower [GO TO T2a]

98. (Don't know) [GO TO T3]

99. (Refused) [GO TO T3]

T2a. In terms of percentage, how lower do you estimate that your store's sales of high-performance and low wattage T8 lamps would have been, in 2011, if the Smart Lighting Choices Program incentive had not been available?

RECORD PERCENTAGE \_\_\_\_%

T3 In 2011, besides the Smart Lighting Choices Program incentive, were there any other rebates provided on high-performance and low wattage T8 lamps?

1. Yes [GO TO T4a]

2. No [GO TO T4]

98. (Don't know) [GO TO T4]

99. (Refused) [GO TO T4]

T3a. Which organization offered the rebate(s) and what was the value of the rebate(s)?

1. Store \$ \_\_\_\_\_

2. Manufacturer1 (specify) \$ \_\_\_\_\_

3. Manufacturer2 (specify) \$ \_\_\_\_\_

4. Natural Resources Canada \$ \_\_\_\_\_

5. Other Federal Government \$ \_\_\_\_\_

6. Provincial Government \$ \_\_\_\_\_

7. City/Town/Municipality \$ \_\_\_\_\_

96. Other \$ \_\_\_\_\_

98. (Don't know)

99. (Refused)

T4. In 2011, how important would you say the incentive from the Smart Lighting Choices Program was in customers' decision to purchase high-performance or low wattage T8 lamps? Please give your response on a scale from 0 to 10, where 0 is "not at all important" and 10 is "extremely important."

T5. If the program stopped this year, what percentage of customers do you think would still buy high-performance or low wattage T8 lamps, meaning that lamps would be 20% to 30% more expensive?

\*(If percentage is too different from percentage given at T2, validate both, and if they remain the same, try to get an explanation)

- T6. Do you think that the \$75 incentive provided to clients for each high-performance or low wattage T8 lamp purchased is sufficient? Is it too low? Is it too high? What would be the appropriate amount?
- T7. Do you think that the \$25 incentive per unit sold provided to your store(s) by ENSC is sufficient? Is it too low? Is it too high? What would be the appropriate amount?
- T8. Do you promote high-performance or low wattage T8 lamps to your customers? Is part of the \$25 incentive used for marketing purposes?

**ASK IF ELECTRONIC BALLASTS WERE REBATED THROUGH THE PROGRAM**

**HPT8 ballasts**

I have a few questions about your sales of HPT8 ballasts.

Our records indicate that your total sales of HPT8 ballasts up to August 2011 amounted to \_\_\_\_\_ products. Furthermore, your sales for 2010 amounted to \_\_\_\_\_ products.

Ask if there is a significant difference (plus or minus 25%) between sales in 2011 (expected) and 2010.

- E1. If the current trend is maintained, your total sales for HPT8 ballasts in 2011 will be significantly lower/higher (*select the appropriate term*) than for the previous year. Is there any reason for this change?

[PROBE: market trend, more competitors offering these products, etc.]

- E2. In 2011, the Smart Lighting Choices Program provided an incentive of \$3 for each HPT8 ballast sold in your store(s). If this incentive had not been available, do you think that your sales of HPT8 ballasts in 2011 would have been about the same or lower?

1. Same [GO TO E3]
2. Lower [GO TO E2a]



98. (Don't know) [GO TO E3]  
99. (Refused) [GO TO E3]

E2a. In terms of percentage, how lower do you estimate that your store's sales of high-performance and low wattage T8 lamps would have been, in 2011, if the Smart Lighting Choices Program incentive had not been available?

RECORD PERCENTAGE \_\_\_\_%

E3. In 2011, besides the Smart Lighting Choices Program incentive, were there any other rebates provided on HPT8 ballasts?

1. Yes [GO TO E3a]  
2. No [GO TO E4]  
98. (Don't know) [GO TO E4]  
99. (Refused) [GO TO E4]

E3a. Which organization offered the rebate(s) and what was the value of the rebate(s)?

- |                             |          |
|-----------------------------|----------|
| 1. Store                    | \$ _____ |
| 2. Manufacturer1 (specify)  | \$ _____ |
| 3. Manufacturer2 (specify)  | \$ _____ |
| 4. Natural Resources Canada | \$ _____ |
| 5. Other Federal Government | \$ _____ |
| 6. Provincial Government    | \$ _____ |
| 7. City/Town/Municipality   | \$ _____ |
| 97. Other                   | \$ _____ |
| 98. (Don't know)            |          |
| 99. (Refused)               |          |

E4. In 2011, how important would you say the incentive from the Smart Lighting Choices Program was in customers' decision to purchase HPT8 ballasts? Please give your response on a scale from 0 to 10, where 0 is "not at all important" and 10 is "extremely important."

E5. If the program stopped this year, what percentage of customers do you think would still buy HPT8 ballasts, meaning that ballasts would be 20% to 30% more expensive?

\*(If percentage is too different from percentage given at E2, validate both, and if they remain the same, try to get an explanation)

- E6. Do you think that the \$3 incentive provided to the client per HPT8 ballast purchased is sufficient? Is it too low? Is it too high? What would be the appropriate amount?
- E7. Do you think that the ¢25 incentive per unit sold provided to your store(s) by ENSC is sufficient? Is it too low? Is it too high? What would be the appropriate amount?
- E8. Do you promote HPT8 ballasts as part of the Smart Lighting Choices Program? Is part of the ¢25 incentive used for marketing purposes?

#### **GENERAL IMPACT OF PROGRAM**

- G1. Overall, do you think that the Smart Lighting Choices program had any impact on your store(s)? [PROBE: increased business, increased product offer, helped promote efficient products, improved skill set of staff, etc.]

THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK YOU FOR TAKING THE TIME TO RESPOND TO THIS INTERVIEW.

## APPENDIX IV - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Econoler site number: \_\_\_\_\_

Business Name: \_\_\_\_\_

Site contact Name: \_\_\_\_\_

Person met during site visit: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

|                   |             |                          |                  |                          |                           |                          |
|-------------------|-------------|--------------------------|------------------|--------------------------|---------------------------|--------------------------|
| Type of facility: | Retail:     | <input type="checkbox"/> | Church:          | <input type="checkbox"/> | Community facility:       | <input type="checkbox"/> |
|                   | Restaurant: | <input type="checkbox"/> | Multi-unit res.: | <input type="checkbox"/> | Other ( <i>Specify</i> ): | <input type="checkbox"/> |

## 2 BUILDING HEATING/COOLING SYSTEM DESCRIPTION

Heating Source: Please fill the table below for each heating source at the site

|                                  | Heating system 1 | Heating system 2 | Heating system 3 | Heating system 4 |
|----------------------------------|------------------|------------------|------------------|------------------|
| Heat source                      |                  |                  |                  |                  |
| Heating system type              |                  |                  |                  |                  |
| Heating system efficiency or COP |                  |                  |                  |                  |

Cooling system: Please fill the table below for each cooling source at the site

|                            | Cooling system 1 | Cooling system 2 | Cooling system 3 | Cooling system 4 |
|----------------------------|------------------|------------------|------------------|------------------|
| Cooling system type        |                  |                  |                  |                  |
| Cooling system SEER or COP |                  |                  |                  |                  |

## 3 FACILITY OPERATION HOURS AND LIGHTING USAGE

*Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

Facility occupancy schedule:

| Occupancy schedule                                                        | 1: Normal |         | 2 (specify): |         | 3 (specify): |         |
|---------------------------------------------------------------------------|-----------|---------|--------------|---------|--------------|---------|
|                                                                           | Weekdays  | Weekend | Weekdays     | Weekend | Weekdays     | Weekend |
| Number of day with regular schedule per year                              |           |         |              |         |              |         |
| Number of day with regular holidays schedule per year                     |           | ----    |              | ----    |              | ----    |
| Number of days with no occupancy per year (For example: seasonal closure) |           |         |              |         |              |         |
| Total number of day per year                                              | 261       | 104     | 261          | 104     | 261          | 104     |

Normal week/holidays  
lighting operation schedule  
(hours per day):

*Please fill the table below for each lighting schedule reported by the site contact as usage could vary for each section of the facility. Use additional sheets if necessary.*

| Schedule # | Lighting schedule                               | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|-------------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours<br>(for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 2          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 3          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |

## 4 MEASURES INFORMATION

*Note: Information from the database may indicate that only lamps or ballast were purchased. However, if the site contact indicates having installed items from the other category, information must also be collected on those items.*

### High Performance T8 lamps

Total number – Baseline Fluorescent T12  
lamps (Contact declaration): \_\_\_\_\_

Total number – Baseline Fluorescent T8  
lamps (Contact declaration): \_\_\_\_\_

Total number – High performance T8  
lamps installed (From database): \_\_\_\_\_

Total number – High performance T8  
lamps installed (On-site validation/Contact  
declaration): \_\_\_\_\_

Collect the information for up to 3 sections:

Section 1

Section 2

Section 3

Measure location: \_\_\_\_\_

Date of installation: \_\_\_\_\_

### High Performance T8 lamps

Type – Baseline Fluorescent T12 or T8 lamps (*Contact declaration*):

Power – Existing Fluorescent T12 lamps [W] (*Contact declaration/On site validation if spare lamps are available*):

Power – Existing Fluorescent T8 lamps [W] (*Contact declaration/On site validation if spare lamps are available*):

Power – High performance T8 lamps installed [W] (*From database*):

Power – High performance T8 lamps installed [W] (*On-site validation*):

Number – Baseline Fluorescent T12 lamps (*Contact declaration*):

Number – Baseline Fluorescent T8 lamps (*Contact declaration*):

Number – High performance T8 lamps installed (*On-site validation*):

Number – High performance T8 lamps installed (*On-site validation*):

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

When were the lamps removed or when did they burn?

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

Hours of use for High performance T8 lamps. *Indicate the corresponding schedule number for each section (Contact declaration)*:

Hours of use for equipment: Indicate the corresponding annual hours:

Percentage of lights that remain ON when the facility is unoccupied, for each section (*Contact declaration*):

### High Performance T8 lamps

Percent of the time when both lighting and

cooling are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Did the site install HPT8 ballast as well? If yes, fill the ballast section.

\_\_\_\_\_

Was the purchase made at the same store or by the same electrician?

\_\_\_\_\_

Indicate the approximate date of purchase:

\_\_\_\_\_

Was another rebate claimed for the purchase? (*For example: BER program, SBES program, Other: specify*)

\_\_\_\_\_

### Reduced wattage T8 lamps

Total number – Baseline Fluorescent T12 lamps (*Contact declaration*):

\_\_\_\_\_

Total number – Baseline Fluorescent T8 lamps (*Contact declaration*):

\_\_\_\_\_

Total number – Reduced wattage T8 lamps installed (*From database*):

\_\_\_\_\_

Total number – Reduced wattage T8 lamps installed (*On-site validation/Contact declaration*):

\_\_\_\_\_

### Reduced wattage T8 lamps

Collect the information for up to 3 sections:

Section 1

Section 2

Section 3

Measure location:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date of installation:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Type – Baseline Fluorescent T12 and/or T8 lamps (*Contact declaration*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Power – Existing Fluorescent T12 lamps [W] (*Contact declaration/On site validation if spare lamps are available*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Power – Existing Fluorescent T8 lamps [W] (*Contact declaration/On site validation if spare lamps are available*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Power – Reduced wattage T8 lamps installed [W] (*From database*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Power – Reduced wattage T8 lamps installed [W] (*On-site validation*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Number – Baseline Fluorescent T12 lamps (*Contact declaration*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Number – Baseline Fluorescent T8 lamps (*Contact declaration*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Number – Reduced wattage T8 lamps installed [W] (*On-site validation*):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

When were the lamps removed or when did they burn?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Hours of use for Reduced wattage T8 lamps. *Indicate the corresponding schedule number for each section (Contact declaration)*:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



### Reduced wattage T8 lamps

Hours of use for equipment: Indicate the corresponding annual hours:

\_\_\_\_\_

Percentage of lights that remain ON when the facility is unoccupied, for each section (*Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and cooling are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Did the site install HPT8 ballast as well? If yes, fill the ballast section.

\_\_\_\_\_

Was the purchase made at the same store or by the same electrician?

\_\_\_\_\_

Indicate the approximate date of purchase:

\_\_\_\_\_

Was another rebate claimed for the purchase? (*For example: BER program, SBES program, Other: specify*)

\_\_\_\_\_

### HPT8 ballast

Total number – Baseline Ballast (*Contact declaration*):

\_\_\_\_\_

Total number – HPT8 ballast (*From database*):

\_\_\_\_\_

Total number – HPT8 ballast (*On-site validation/Contact declaration*):

\_\_\_\_\_

| HPT8 ballast                                                                                    |           |           |           |
|-------------------------------------------------------------------------------------------------|-----------|-----------|-----------|
| Collect the information for up to 3 sections, for example similar rooms on different floors:    | Section 1 | Section 2 | Section 3 |
| Measure location:                                                                               | _____     | _____     | _____     |
| Date of installation:                                                                           | _____     | _____     | _____     |
| Total number – Baseline ballasts ( <i>Contact declaration</i> ):                                | _____     | _____     | _____     |
| Total number – HPT8 ballasts installed ( <i>From database</i> ):                                | _____     | _____     | _____     |
| Total number – HPT8 ballasts installed ( <i>On-site validation/Contact declaration</i> ):       | _____     | _____     | _____     |
| Manufacturer name – Baseline ballast ( <i>Site validation if spare parts are installed</i> ):   | _____     | _____     | _____     |
| Model number – Baseline ballasts ( <i>Site validation if spare parts are installed</i> ):       | _____     | _____     | _____     |
| Type – Baseline Ballast ( <i>Site validation if spare parts are installed</i> ):                | _____     | _____     | _____     |
| Ballast factor – Baseline ballast ( <i>Site validation if spare parts are installed</i> ):      | _____     | _____     | _____     |
| Number of lamps – Baseline ballast [1L, 2L, 3L, 4L, etc.] ( <i>On-site validation</i> ):        | _____     | _____     | _____     |
| Manufacturer name – HPT8 ballasts installed ( <i>From database</i> ):                           | _____     | _____     | _____     |
| Model number – HPT8 ballasts installed ( <i>From database</i> ):                                | _____     | _____     | _____     |
| Number of lamps – HPT8 ballasts installed [1L, 2L, 3L, 4L, etc.] ( <i>From database</i> ):      | _____     | _____     | _____     |
| Number of lamps – HPT8 ballasts installed [1L, 2L, 3L, 4L, etc.] ( <i>On-site validation</i> ): | _____     | _____     | _____     |
| Ballast factor – HPT8 ballast installed ( <i>On-site validation</i> ):                          | _____     | _____     | _____     |

**HPT8 ballast**

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

\_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding annual hours:*

\_\_\_\_\_

Percentage of lighting that remains on when the facility is closed in each section (*Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and cooling are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON for each section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for this section (*Site validation/Contact declaration*):

\_\_\_\_\_

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

\_\_\_\_\_

When were the lamps removed or when did they burn?

\_\_\_\_\_

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

\_\_\_\_\_

Did the site install High-performance T8 lamps as well? If yes, fill the lamp section.

\_\_\_\_\_

Was the purchase made at the same store or by the same electrician?

\_\_\_\_\_

**HPT8 ballast**

Indicate the approximate date of purchase:

\_\_\_\_\_

Was another rebate claimed for the purchase? (For example: BER program, SBES program, Other: specify)

\_\_\_\_\_

**COMMENTS OR NOTES**



# **COMMERCIAL & INDUSTRIAL CUSTOM AND NEW CONSTRUCTION PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 22, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Commercial and Industrial (C&I) Custom program. The C&I Custom program is divided into the following two distinct program components:

- > the Commercial and Industrial Custom Retrofit (C&IC) program component; and
- > the Commercial and Industrial Custom New Construction (CINC) program component.

These two components are significantly different and Efficiency Nova Scotia Corporation (ENSC) manages each of them as separate programs. For instance, each one has a dedicated Program Manager (PM), a stand-alone program manual and a separate tracking sheet for program impact monitoring. Consequently, most of the evaluation activities were conducted separately.

The 2011 evaluation was based on in-depth interviews with the two PMs, two verification partners and five participants (four C&IC program participants and one CINC program participant). In addition, the Evaluator performed 25 on-site visits as well as a telephone survey of 27 program participants. The analysis and program evaluation results are presented separately for each of the two C&I Custom program components.

## **PROGRAM OVERVIEW**

The C&I Custom programs provide technical assistance, financial incentives and project financing to help medium and large C&I customers reduce their electrical energy consumption and demand. The description of each C&I program component is detailed below.

### **C&IC Program Component**

The C&IC program component provides incentives to help eligible ENSC customers conduct scoping and feasibility studies as well as implement technical changes in their facilities and carry out the required measurement and verification (M&V) of project performance. The C&IC program targets mainly retrofit and improvement projects on existing equipment. The C&IC program, launched in May 2008, is budgeted to run through 2012.

In 2011, C&IC program design and implementation were upgraded in several aspects. Notably, program staffing has been improved to alleviate bottlenecks and reduce the likelihood of data entry errors in the tracking sheet. Furthermore, since the verified total peak demand savings were under target in 2010, the C&IC program focused on new larger projects and examined more closely the project applications in 2011. The goal was to foster the realization of peak demand savings for this period. Moreover, the PM held several meetings with sales representatives for each type of measure promoted through the program so that they could be more proactive in marketing the program. The activities of the sales leads were included in the C&IC program, so the PM is now able to monitor the

sales leads with performance indicators and can therefore determine their effectiveness in terms of realization ratios. The use of such ratios is considered a very good practice. Finally, within the website material, there is a program overview chart that describes the different project phases along with the documents needed to help participants understand the different phases as well as all related forms. This is considered an excellent initiative.

The C&IC program component was expected to generate most of the overall C&I Custom program savings with a net energy savings goal of 43 GWh and almost 10 MW for peak demand savings in 2011.

### **CINC Program Component**

The CINC program component provides technical assistance and financial support to help commercial and industrial customers achieve significant and predictable electrical energy savings in new commercial and industrial buildings, through additions and major renovations. Under this component, participants must follow one of three participation paths:

- the New Construction Core Performance (NCCP) path, based on compliance with the Advanced Buildings Core Performance Guide (CPG), which is described as a “prescriptive program to achieve significant, predictable energy savings in new commercial constructions”;
- the New Construction Whole Building (NCWB) path, an alternative to the NCCP path for buildings that do not meet the size or building type requirements of the CPG, are more complex in design or are required to do energy modeling for another reason; or
- the Prescriptive Rebate path provided by the Business Energy Rebates (BER) program.

The CINC program was launched in October 2010. To date, no major adjustment has been made to its design and implementation process since only two new construction projects in 2010 had been enrolled and only nine projects were expected for 2011.

The CINC program component aimed at achieving net electricity savings of 4.8 GWh and demand savings of 1.5 MW for the year 2011.

## **KEY FINDINGS**

The 2011 evaluation of the C&IC and CINC programs demonstrated that these programs have a good potential for success. The two programs totalled 168 projects for the year 2011 (159 for the C&IC and nine for the CINC), which is a substantial increase compared to last year (102 projects). Moreover, the evaluated energy savings and peak demand savings have almost doubled. In terms of net energy savings, the C&IC and CINC programs generated respectively 30.323 GWh and 2.607 GWh, totaling 32.930 GWh in 2011, which represents a considerable increase in comparison to 2010 net savings (total of 19.413 GWh). It also realized generated 3.764 MW peak demand savings compared to 2.406 MW in 2010.

## **Awareness**

In order for the number of participants to keep increasing and to ensure program continuity in the years to come, program awareness constitutes an important aspect of the program strategy. The evaluation revealed that the main source of awareness for the C&IC program was ENSC's marketing outreach and activities (ENSC staff, ENSC presentation or ENSC website). It should be noted, nevertheless, that almost half of the participants had participated in other Nova Scotia Power Incorporated (NSPI) or ENSC programs prior to participating in the C&IC program, which is an important source of awareness. Moreover, the addition in 2010 and 2011 of sales leads clearly contributed to the increased participant number.

From a participation point of view, these are indications that program marketing efforts are improving from past years, which means that the program clearly evolved in the right direction.

## **Satisfaction**

Satisfaction towards the C&IC program has also increased from last year. In particular, satisfaction towards the interaction and communication with staff and consultants has increased since these specific aspects of the program might have been problematic last year due to the change from NSPI to ENSC. As part of the evaluation of the C&IC program, some participants gave recommendations to improve program effectiveness in order to have things moving faster (more staff, more on-site visits, more technical knowledge of staff) while others expressed concerns about the M&V process (only half of participants are satisfied with verifications). Despite the above, global satisfaction remains high and is not an issue.

## **Program Energy Savings**

To calculate the net savings of the C&IC and CINC programs in 2011, the Evaluator used an approach that included conducting on-site visits of sample projects and in-depth interviews with sample participants for both programs. Then, the Evaluator calculated the gross energy and peak demand savings for all sample projects, in accordance with the specifics of each project type. This calculation resulted in adjustment factors that are used to estimate the overall gross savings of both programs.

Afterwards, the Evaluator determined the proper net-to-gross ratios (NTGRs) to be applied for each program through the evaluation of free-ridership and internal spillover effects. Through this approach, a free-ridership level of 7 percent was captured, which represents a slight decrease when compared to last year. On the other hand, no potential spillover was identified. The details of the NTGR calculations are presented in the next table. Finally, the NTGR found for each program led to the calculation of the net energy and peak demand savings of the C&IC and CINC programs for 2011.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

| <b>Distortion Factors</b> | <b>2011</b> |
|---------------------------|-------------|
| Free-Ridership Level      | 7%          |
| Spillover Level           | 0%          |
| Net-to-Gross Ratio        | 0.93        |

The evaluation revealed that the C&IC and CINC programs had respectively generated net energy savings of 30.323 GWh and 2.607 GWh at the generator in 2011. Regarding electricity demand reduction, the C&IC program realized net peak demand savings at the generator of 3.764 MW in 2011, while no peak demand savings were calculated for the CINC program in 2011. The next table presents the sums of C&IC and CINC program savings, along with the savings targets and the savings tracked by ENSC for the same year.

**Table 2: 2011 Net Savings at the Generator of the C&IC and CINC Programs**

|                           | <b>Gross Savings</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|----------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                      |             |                    |
| Tracked Savings from ENSC | 36.184 GWh           | 0.90        | 32.565 GWh         |
| <b>Evaluation Results</b> | <b>35.409 GWh</b>    | <b>0.93</b> | <b>32.930 GWh</b>  |
| <b>Demand Savings</b>     |                      |             |                    |
| Tracked Savings from ENSC | 3.949 MW             | 0.90        | 3.554 MW           |
| <b>Evaluation Results</b> | <b>4.047 MW</b>      | <b>0.93</b> | <b>3.764 MW</b>    |

As per the last table, the evaluated net energy savings of the C&IC and CINC programs are higher than those tracked by ENSC by approximately 1 percent. This difference is mainly due to the improvement of the free-ridership level, from 10 percent in 2010 to 7 percent for 2011 evaluation. This difference in the free-ridership level is due in part to the enhanced screening process put in place by ENSC. This process was improved with all participants who signed the PDA in 2011.

In regard to the C&IC program impact evaluation, Econoler also made slight adjustments to the calculated gross savings in accordance with the outcomes of the assessment of 23 sample projects. In detail, the energy savings of the sample projects that involved only lighting retrofits were reduced by 0.5 percent while all other C&IC sample projects had their tracked energy savings reduced by 5 percent.

With regard to the net demand savings, the evaluated values are higher than those tracked by ENSC. The reason for this is that Econoler adjusted upward a number of diversity factors used for computing the peak demand savings of sample projects, in accordance with equipment operations and

particularities. Econoler considered that the diversity factors used by ENSC were sometimes too conservative, especially for the lighting retrofit projects.

## **RECOMMENDATIONS**

Econoler finds that the C&IC program works generally well and at a satisfactory level. On the other hand, the CINC program presents a great potential of success and Econoler identified several opportunities for improving it. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following recommendations that are aimed at optimizing specific aspects of each program:

### **Recommendations for the C&IC Program:**

- C&IC-R1. Clearly define the M&V requirements before signing the PDA:** The Evaluator noted that most of the projects do not have a dedicated M&V plan even though M&V was considered as complete and approved. The Evaluator recommends that all projects have an M&V plan outlined in the early stages of the project process. The M&V plans should be compliant with the International Performance Measurement and Verification Protocol (IPMVP). The Evaluator also recommends developing the M&V plan before signing the PDA. The PDA may even enclose a preliminary version of the project's M&V plan. In 2011, ENSC started developing a set of M&V plan templates (especially for simple lighting retrofit projects) which are compliant with the IPMVP. These templates should significantly help program participants develop their own M&V plan and is a first step toward standardizing the M&V activities performed under the C&IC program.
- C&IC-R2. Envisage performing third-party M&V for a number of C&IC projects:** ENSC should consider performing third-party M&V on projects where the implementation firm is also the one conducting M&V under its project scope of work. Such implementation firms may perform M&V that is not compliant with the IPMVP or that includes measures which are not eligible for the C&IC program but are not simple to extract from the M&V results. In addition, giving the sole responsibility of M&V to the firm that also implements the project may be risky. To reduce this risk, the Evaluator recommends engaging third-party M&V for such projects. A minimum threshold of energy savings could also be defined to differentiate projects that would automatically require third-party M&V from those for which it would be optional. The Evaluator believes that third-party M&V could be done either by ENSC or by an independent consultant.

**Recommendations for the CINC Program:**

- CINC-R1. Conduct a separate complete evaluation for the CINC program:** In 2010, only one new construction project was included in the C&IC program. This project was implemented using a “whole building” approach and its savings accounted for a small percentage of total C&IC program impacts. As mentioned previously, the CINC program included nine projects in 2011 and generated almost 3 GWh per year of gross savings at the generator. The impacts of the CINC program are also expected to increase in the upcoming years. Accordingly, Econoler believes ENSC should conduct a separate complete evaluation for the CINC program in 2012. Moreover, a separate evaluation could help shed light on some uncertainties in calculating the savings related to CPG compliance (technical documentation, building simulations from the Advanced Buildings Institute (ABI), potential demand savings, etc.).
- CINC-R2. Compare the actual building consumption with the design simulations and make appropriate adjustments (if required):** In regard to M&V activities that are undertaken up to three years following program completion, the Evaluator recommends comparing the building real consumption to the modeling results. This will help appreciate the level of discrepancy between simulation and reality, and adjust the software results if necessary. If the program allows the use of different software, this comparison could help identify which one is closest to reality. It was mentioned that ABI would do this comparison when data is available.
- CINC-R3. Clearly define the CPG minimum requirements at the early stage of the CINC projects:** The Evaluator noticed that the M&V step of the program process was an issue for program participants who conduct their projects under the NCCP path. The verification partner met during the process evaluation also highlighted this matter. With this in mind, the Evaluator recommends providing the participants with the standardized minimum requirements document as soon as possible in the project process (at least before starting the construction work). Moreover, the Evaluator encourages ENSC to add more detail to the minimum requirements documents as well as to draw up a set of examples and/or templates of requirement documents that would comply with the CPG. This could help the participants ensure that they prepare and provide the proper documentation.
- CINC-R4. Add a limited amount of peak demand savings in project impact calculations:** For 2011, ENSC did not calculate electricity demand savings for the CINC projects. When reviewing the New Buildings Institute’s simulations, the Evaluator noted that demand savings had actually been estimated for each building type. Even though such demand savings are very small per project, they could raise the overall impact of the program with future increases in the number of program participants.



# **1 C&I CUSTOM PROGRAM DESCRIPTION AND BACKGROUND**

Efficiency Nova Scotia Corporation's (ENSC) Commercial and Industrial (C&I) Custom Program provides technical assistance, financial incentives and project financing to help medium and large C&I customers reduce their electrical energy consumption and demand. The C&I Custom Program offers such services by targeting retrofit projects aiming to increase the energy efficiency of existing equipment as well as promoting highly-efficient new construction or major renovations to existing buildings. Accordingly, the C&I Custom Program was divided by ENSC into the following two distinct program components:

- > the Commercial and Industrial Custom Retrofit (C&IC) program component; and
- > the Commercial and Industrial Custom New Construction (CINC) program component.

For the sake of clarity and succinctness, the two abovementioned acronyms (C&IC and CINC) will be used respectively for referring to one program component or the other.

## **1.1 C&IC PROGRAM OVERVIEW**

This section presents the description of the C&IC program component, as well as the project and measure eligibility criteria.

### **1.1.1 Program Description**

Through the C&IC program component, incentives are provided to help eligible ENSC customers conduct scoping and feasibility studies as well as implement technical changes in their facilities and carry out the required measurement and verification (M&V) of project performance. In contrast with the CINC program, the C&IC program targets mainly retrofit and improvement projects on existing equipment or systems.

The C&IC program is designed to accommodate a wide range of customer requirements and support a variety of energy efficiency and demand reduction initiatives. Program delivery is structured so that customers may participate in any phase of their project prior to installation, regardless of their current level of energy management expertise or their available funds for such projects.

The C&IC program is the component expected to generate most of the overall C&I Custom program savings with a net energy savings goal of 43 GWh and almost 10 MW for peak demand savings in 2011. The C&IC program generated net energy savings of 19.41 GWh in 2010 and 16.31 GWh for 2008 and 2009 combined.

### **1.1.2 Program Eligibility**

As stated in its program manual, project sites eligible to participate in the C&IC program must be institutional, charitable, commercial or industrial facilities. They must also be directly or indirectly served by Nova Scotia Power Incorporated (NSPI). Furthermore, eligible accounts typically have a peak electrical demand of 250 kW (kVA) or higher. However, customers may group multiple smaller (<250 kW) facilities into a single project that would be eligible, as long as this approach remains cost-effective and all other requirements are fulfilled.

On the program standpoint, ENSC usually approves projects for which expected electricity savings are higher than 20 MWh per year. Projects that do not save electricity are automatically ineligible. Moreover, the project energy and demand savings cannot exceed the actual usage provided by NSPI. Accordingly, energy savings from a non-utility supply, such as cogeneration, self-generation or deliveries from another commodity supplier, do not qualify for technical and financial support from the C&IC program.

Within an eligible project, no energy-saving technologies are specifically prescribed. ENSC evaluates the eligibility of each measure on a case-by-case basis. Typical approved measures involve lighting, compressed air, industrial processes, refrigeration, motors and drives, along with heating, ventilating and air conditioning (HVAC) systems. Measures involving demand limiting controls, power factor correction systems, cogeneration or fuel switching are deemed ineligible for reasons that are explicitly detailed in the program manual.

With regard to project cost eligibility, expenses that are considered eligible for assistance are typically incurred by the customer in completing the preliminary studies or implementing the project on site. For instance, the following costs are eligible for assistance under the C&IC program:

- > engineering (consultant or in-house staff) fees;
- > equipment purchase and delivery costs;
- > installation labour;
- > harmonized sales tax (HST) (if the customer pays HST and is not eligible for an HST rebate).

Contingency amounts are not considered as eligible project costs.

Finally, the C&IC project selection process includes free-ridership screening questions to potential participants in order to identify customers that would have completed the project without ENSC assistance. The program manual presents the complete free-ridership screening questions along with the process prior to sending out incentive estimates. For example, these questions aim at determining the payback period required to move ahead with the project and how the project payback period varies in relation with funding from organizations other than ENSC (if any). In addition, the questions evaluate whether the start of project implementation was moved up due to ENSC incentives.

## **1.2 CINC PROGRAM OVERVIEW**

The next sections present the description of the CINC program component as well as its main eligibility criteria.

### **1.2.1 Program Description**

ENSC launched the CINC program on October 1, 2010 as a component of the C&I Custom program. The CINC program provides technical assistance and financial support to help commercial and industrial customers reduce their electrical energy consumption and demand.

Under the CINC program, incentives are granted to help eligible customers achieve significant and predictable electrical energy savings in new commercial and industrial buildings, additions and major renovations. Eligible projects must be a commercial<sup>1</sup> or industrial facility served (directly or indirectly) by NSPI.

Delivery of the program is structured for the customer to participate from the preliminary design stage in order to effectively implement the program measures and realize maximum energy savings.

Customers interested in participating in the CINC program must follow one of three participation paths: the New Construction Core Performance (NCCP) path, the New Construction Whole Building (NCWB) path or the Prescriptive Rebate path provided by the Business Energy Rebates (BER) program.

- > **The NCCP path** is based on compliance with the Advanced Buildings Core Performance Guide (CPG), which is described as a “prescriptive program to achieve significant, predictable energy savings in new commercial constructions”.<sup>2</sup> The CPG defines a set of simple, discrete strategies and building features that must be integrated into building design and construction. When applied as a package, the CPG requirements are expected to help achieve 25 to 35 percent of energy savings beyond the performance of the 1997 Model National Energy Code for Buildings (MNECB). The CPG is typically applicable to buildings whose size ranges from 900 to 6,500 square metres (10,000 to 70,000 square feet).
- > **The NCWB path** is an alternative to the NCCP path for buildings that do not meet the size or building type requirements of the CPG, are more complex in design or are required to do energy modeling for another reason (for example, to be compliant with Leadership in Energy and Environmental Design “LEED” design requirements). Within the- NCWB path, customers may be eligible to receive incentives for a feasibility study (including a building performance

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<sup>1</sup> Under the CINC program, the “Commercial Building” category includes any non-residential projects, such as institutional, educational or not-for-profit new constructions.

<sup>2</sup> FRANKEL, Mark et al., “Core Performance Guide: Efficiency Nova Scotia Corporation Edition 1.00,” New Building Institute – Advanced Buildings Program, 2010.

simulation) and then for the building construction. The incentive evaluation of each project is made on a case-by-case basis, as it is made for the C&IC program.

- > **The New Construction Prescriptive Rebate path** is also offered within the CINC program, even though this path is essentially another way to participate in the BER program. In other words, this path functions as a typical BER project process and is covered through the BER program. Eligible projects must therefore comply with BER program requirements. This new construction BER path is promoted as part of the CINC program by ENSC so that customers with small construction projects do not feel as though they are automatically excluded from the CINC program. Hence, the project process is facilitated through CINC (meeting with customers, providing advice, reviewing building design) but financial incentives are provided through the BER program.

Depending on the program path selected, incentives are awarded based on:

1. A specific amount per floor area (\$/square metre) of building space for full implementation of the prescribed package of measures, as per CPG requirements. In 2011, all projects that were considered to be fully compliant with CPG requirements received an incentive of about \$10.76/m<sup>2</sup> (\$1.00/ft<sup>2</sup>);
2. A percentage of the incremental measure costs (and labour costs, if any) or energy savings to be realized. Either of these values can be calculated through comparison of the high-performance equipment and the standard efficiency equivalent. This calculation is more likely to be used by ENSC on a measure-by-measure basis for sizing incentives to be granted under the NCWB path;
3. A schedule of established incentives for a predetermined list of common high-efficiency measures ("prescriptive" approach); or
4. A combination of 2 and 3 above.

In spite of Criteria 2 and 3 above, ENSC granted a financial incentive of \$0.10/kWh saved for each project carried out under the NCWB path that has been approved during the year 2011. Additionally, NCWB participant costs may also be eligible for program reimbursement or incentives, including the expenses incurred by the customer in developing and implementing an eligible project.

The CINC program component aimed at achieving net electricity savings of approximately 4.8 GWh for the year 2011. With regard to net demand savings, the combined overall target of the C&IC and CINC program components was 10.4 MW in 2011.

### **1.2.2 Program Eligibility**

Measures funded by the CINC program must cost-effectively save electrical energy. Typical cost-effective measures that are eligible for the program include:

1. Measures identified in Sections 1 and 2 of the CPG;
2. A package of measures identified through the NCWB approach and agreed upon by both the customer and ENSC. The energy saving calculations and modeling must demonstrate the overall cost-effectiveness of the proposed package of measures.
3. Individual custom measures, as agreed upon by both the customer and ENSC.
4. Individual prescriptive measures as identified in the BER program and which comply with its requirements.

For each of the above eligibility criteria, ENSC remains the sole authority that can decide whether or not a given technology is considered eligible in a particular situation, regardless of the type of facility or equipment operations.

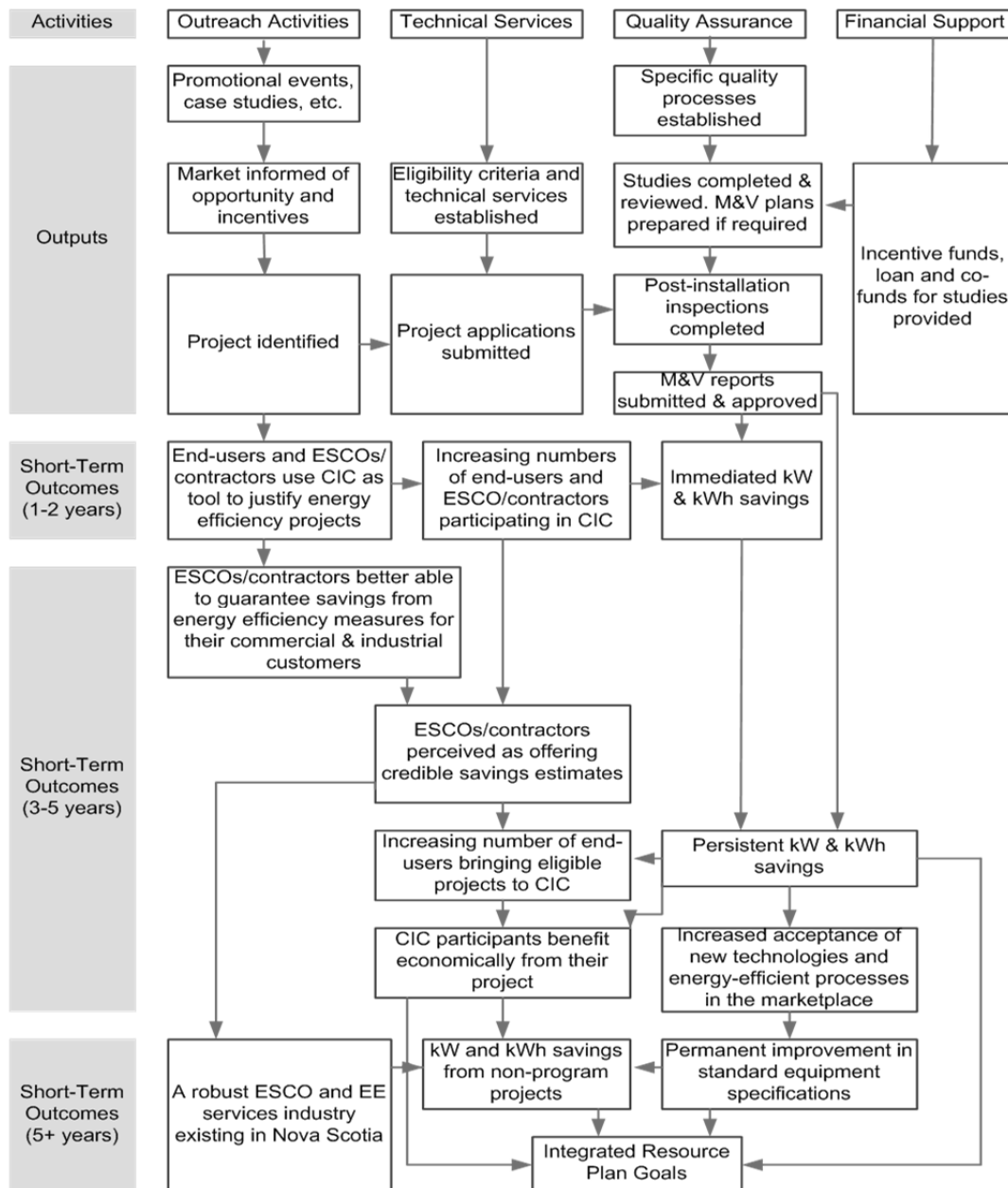
Finally, through the CINC program process, ENSC may carry out free-ridership screening before incentives are committed to the project under evaluation. ENSC reserves full discretion to identify measures or design techniques which it considers “common practice” in its service territory. ENSC usually provides incentives only for measures which exceed the deemed common practice.

## 2 PROGRAM LOGIC MODELS

### 2.1 C&IC PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

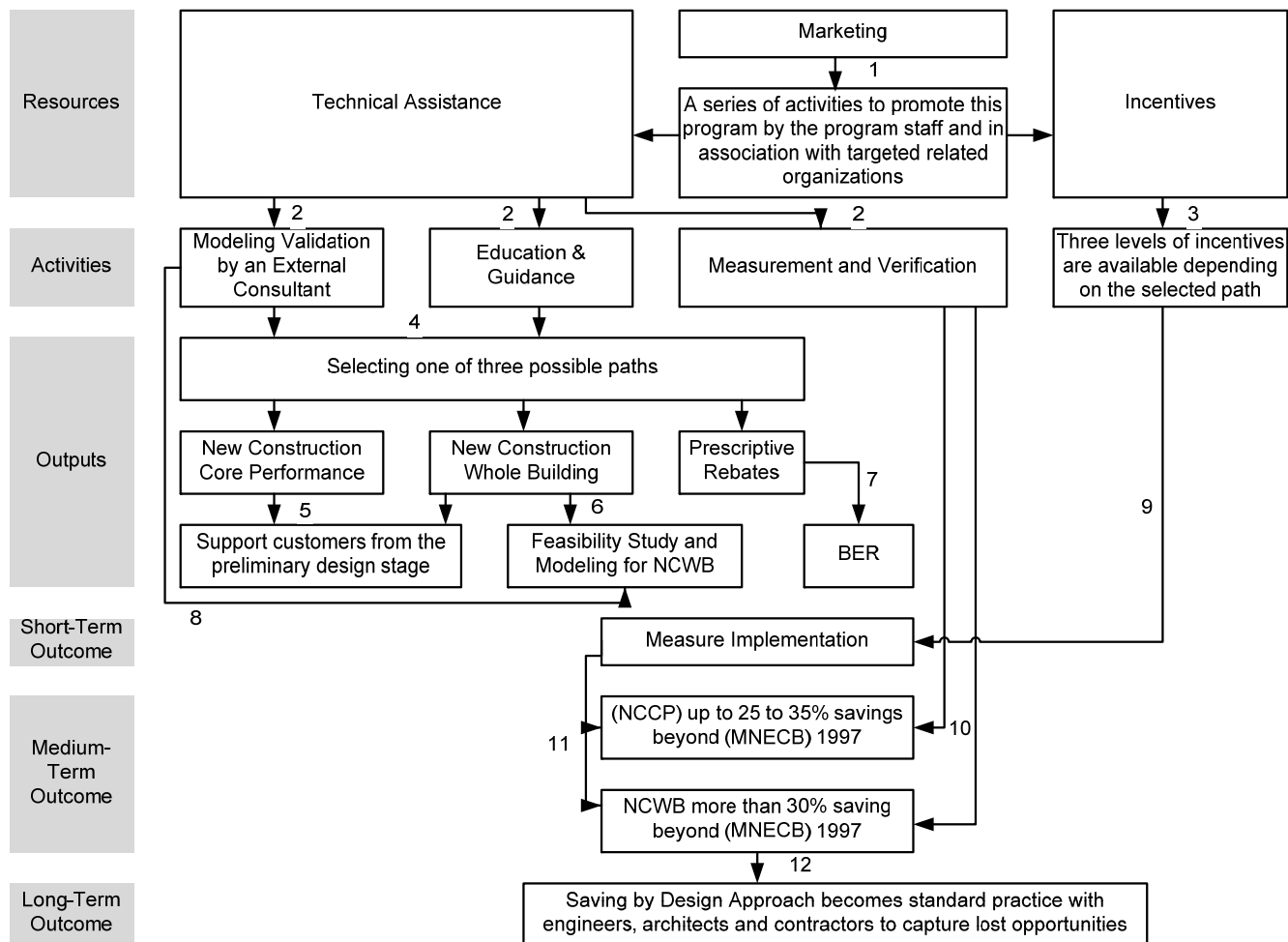
**Figure 1: C&IC Program Logic Model**



## 2.2 CINC PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 2: CINC Program Logic Model<sup>3</sup>**



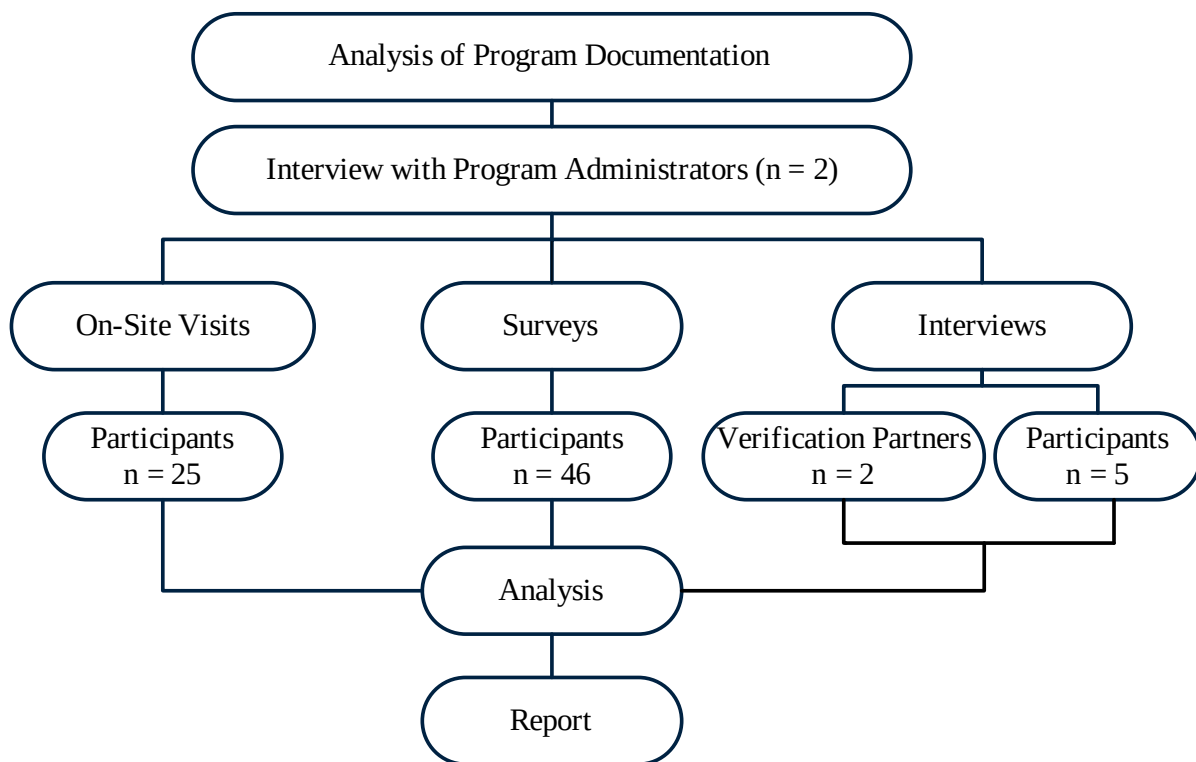
<sup>3</sup> The numbers 1 through 12 contained in this logic model explain the relationship between the different levels involved. They are presented in Appendix II.

### 3 METHODOLOGY

#### 3.1 METHODOLOGICAL MODEL

The figure below illustrates the research strategy used for the 2011 evaluation and features the collection tools used.

**Figure 3: Methodological Model**





## **3.2 METHODOLOGY DESCRIPTION**

### **3.2.1 Analyzing Existing Program Information**

The first task in the process evaluation of the C&I Custom program was an analysis of the program documentation. At that stage, the key available program information was reviewed.

The information used for conducting this analysis was obtained primarily from the following five sources:

- > ENSC website;
- > 2010 evaluation report;
- > C&IC and CINC program manuals;
- > C&IC sample project folders;
- > tracking sheet.

### **3.2.2 In-Depth Interviews with Program Managers**

The Evaluator conducted two interviews in September with the Program Managers (PMs). One interview covered the C&IC program component whereas the second interview focused more specifically on the CINC program component. The interviews covered a variety of program-related topics. Below are some of the elements examined through the in-depth interviews with the PMs:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow chart;
- > role of the program partners;
- > prior evaluation recommendations.

Based on the results of the PM interviews, the list of questions and topics to include in the program partners' interviews for process evaluation was finalized.

For reference purposes, the protocol used by the Evaluator during their in-depth interviews with PMs is presented in Appendix IV.

### **3.2.3 On-Site Visits**

In November, 25 on-site visits were conducted at facilities that had participated in either the C&IC or CINC program in 2011. These on-site visits were conducted by Econoler's subcontractor, Equilibrium Engineering. These site visits helped to validate the technical specifications of the new and old equipment as well as its operation schedule. In addition, the Evaluator collected information on the facility characteristics.

The methodology used for the on-site visits carried out for the C&IC and CINC program evaluation is further explained in the program impact evaluation section of this report. A copy of the site visit protocols is included in Appendix VIII.

### **3.2.4 Participant Survey**

A telephone survey with a total of 27 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, Nova Scotia (NS). Only participants who had completed C&IC projects were contacted during the in-field survey. The interviews were conducted in November utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 17.5 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > previous program participation;
- > how participants learned about the program;
- > spillover and free-ridership;
- > participant motivations and barriers;
- > satisfaction with the program.

The demographic profile of survey respondents is shown in Appendix III, while the survey questionnaire is presented in Appendix VII. The table below shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

| Survey                         | Population | Sample Size (n) | Sampling Error at 90% Confidence Level |
|--------------------------------|------------|-----------------|----------------------------------------|
| 2010 Participants              | 47         | 13              | ±19.6%                                 |
| 2011 Participants <sup>4</sup> | 159        | 27              | ±14.4%                                 |

### 3.2.5 In-Depth Interviews with Partners

In September, two in-depth interviews were conducted with program verification partners. They are external consultants who assist ENSC in reviewing submitted energy projects and provide technical assistance to program participants. One interview was made with a verification partner of each of the C&I Custom program components (C&IC and CINC). These interviews were meant, among other things, to understand the verification partners' involvement with the program, their participation process in the program as well as their perception and satisfaction with the program.

For reference purposes, the protocol used by the Evaluator during their in-depth interviews with program verification partners is presented in Appendix V.

### 3.2.6 In-Depth Interviews with Participants

In November, five in-depth interviews were conducted with 2011 program participants (four interviews with C&IC participants and one with a CINC participant). These interviews were used mainly for measuring spillover effects. This was achieved by identifying potential energy efficiency projects implemented, or currently being pursued, without the financial and/or technical support from the C&I Custom Program, but which may have been influenced by participation in the program. The interviews also aimed at understanding the participants' satisfaction with the program process and outcomes.

For reference purposes, the protocol used by the Evaluator during their in-depth interviews with program participants is presented in Appendix VI.

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<sup>4</sup> The sampling population for the 2011 survey was 68 participants, which was the number of program participants at the time of conducting the survey.

## 4 PROCESS EVALUATION

### 4.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the C&IC and CINC programs focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

### 4.2 C&IC PROGRAM PROCESS EVALUATION

This section presents key outcomes from the process evaluation performed by the Evaluator for the C&IC program.

#### 4.2.1 Program Manual Content

The program manual features key information on program process and tracking for internal use and is an essential reference tool for all program staff. In addition, the program manual has been widely used by the Evaluator throughout the program process and impact evaluation activities.

Program manuals are usually custom-designed to meet an organization's specific needs. For the same organization, the program manual contents might vary in accordance with the specificities of each program. However, a certain amount of basic information is typically included in program manuals intended for internal use. More specifically for the C&IC program, the table below presents such typical program manual contents along with what was found in the C&IC program manual.

**Table 4: C&IC Program Manual Content Evaluation**

| Program Manual Content                                    | C&IC Program Manual |
|-----------------------------------------------------------|---------------------|
| Document revisions                                        | ✓                   |
| Program description (including nature or type of program) | ✓                   |
| Program justification                                     | ✓                   |
| Program objectives                                        | ⚠                   |
| Incentives                                                | ✓                   |
| Eligibility criteria                                      | ✓                   |
| Program partners and their roles                          | ✓                   |

| Program Manual Content                                                                                                                   | C&IC Program Manual |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Program barriers                                                                                                                         | ✓                   |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects)                             | N/A                 |
| Details about the savings calculations and type of measures                                                                              | ⚠                   |
| Budget per year                                                                                                                          | ✓                   |
| Cost-effectiveness test results                                                                                                          | ✓                   |
| Market study or technical study that supports program elements or assumptions                                                            | ⊘                   |
| Marketing plan                                                                                                                           | ✓                   |
| Evaluation plan                                                                                                                          | ⊘                   |
| Program theory                                                                                                                           | ⊘                   |
| Logic model                                                                                                                              | ✓                   |
| Program process flow chart                                                                                                               | ✓                   |
| Partner or participant process flow chart                                                                                                | ✓                   |
| Program forms                                                                                                                            | ✓                   |
|  Information included in the program manual           |                     |
|  Information partially included in the program manual |                     |
|  No information                                       |                     |

The Evaluator analyzed the C&IC program manual and found that it contains relevant information useful for both the PM and the Evaluator. However, Econoler proposes the following recommendations that are aimed at improving the tool:

- > **Add more information on M&V aspects:** In the M&V section of the program manual (Section 5.7), there should be additional information describing who pays for M&V activities, who selects the Option (A, B or C) of the International Performance Measurement and Verification Protocol (IPMVP) to be used and who accepts it. The fact that all projects are measured should also be mentioned. During the 2011 program evaluation, the PM advised Econoler that a new M&V section was being drafted, with the aim of including it in the 2012 program manual. Econoler therefore recommends including at least the above-mentioned information in this new M&V section.

- > **Explain the “Custom Client Response Process” form in the program manual:** The “Custom Client Response Process” form has multiple purposes such as determining project eligibility, establishing the level of incentive, estimating free-ridership levels, etc. This should be explained in the program manual.
- > **Clarify the use of the terms “preliminary energy audit” and “scoping study”:** In the program literature, the terms “preliminary energy audit” and “scoping study” are used alternatively. It may be confusing since an energy audit can be considered either a scoping study or a complete feasibility study. It is recommended to always use the same two terms (scoping study and feasibility study) so as to avoid such confusion among future participants. The program literature should clearly state that the term “scoping study” encompasses typical preliminary energy audits and then stop using the other one. Noteworthy is that this recommendation is also applicable to the ENSC website.
- > **Provide the parameters used for estimating program objectives:** The program objectives are forecast in terms of net savings. This means that they include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the gross savings. These parameters should be documented in the program manual so that the PM and the Evaluator can keep track of the assumptions used to estimate the program targets. After each evaluation, these parameters are adjusted accordingly for estimating the program objectives of the years to come.
- > **Complete the program manual to keep track of changes and standardize the content:** The program manual is well written, but the information is not comprehensive enough to serve as “program memory” in case of modifications or staff changes (e.g. program justifications and total savings objectives are missing). Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

#### **4.2.2 Program Tracking Sheet**

As part of the program process evaluation, the Evaluator reviewed the contents and structure of ENSC’s tracking sheet for the C&IC program. In general, the tracking sheet is useful and provides the PM with a way to continuously monitor project progress and forecast program savings. The necessary details for program administration and evaluation purposes are usually present but some improvements could be made to make this tool a better asset for the PM and the Evaluator.

The program projects can also be tracked online through the Demand Side Management Data System (DSMDS). The DSMDS contains useful information such as the contact details of each participant which was used by the Evaluator for scheduling site visits and conducting the phone survey. In regard to program impact calculations, this tracking tool has, however, not been used much by the Evaluator since it was more challenging to extract data from this system than directly using the PM’s tracking

sheet. After briefly consulting the DSMDS online, the Evaluator elected to rely only on the program tracking sheet and electronic folders provided by ENSC for program impact evaluation.

That being said, the PM confirmed that the program data on the DSMDS are kept up to date and are used frequently by program staff.

In detail, the program tracking sheet submitted by ENSC is an Excel spreadsheet that contained eight sheet tabs. Among them, the sheet tab named “Projects” was especially useful for evaluation purposes. In fact, this sheet is the main tracking tool of the file. This database presents key information on all approved projects, such as contact information, project status, incentive amounts granted (or to be granted) as well as forecast energy and demand savings. On this sheet, the energy and peak demand savings are calculated using the forecast data (from either the Project Development Agreement (PDA) or the M&V) and a percentage of installation for each year. Hence, the PM must make sure that, for each project, the overall energy and demand savings figures are up to date and the source of data is well identified. The PM can also modify the installation ratio on a regular basis depending on the project implementation status. The annual forecast saving values are then calculated automatically for the current year, using the same installation ratio for both energy and demand savings. Altogether, this sheet is quite complete and has been very useful throughout the program evaluation process.

In addition to the electronic tracking spreadsheet, ENSC also keeps an electronic folder for each project. In general, the structure of each project folder was quite consistent. The Evaluator also noticed that there were several notes in the project folders and subfolders that helped the user understand the contents of the respective folder/subfolder. Furthermore, many “Superseded” subfolders could be found in the project folders. Such subfolders are used for storing old versions of electronic files, which could be useful to track project history.

Prior to January 1, 2011, each project was assigned numbers using the format “C-XXXXXX-Y,” “X” being the customer ID and “Y” being a sequential number for each project carried out by the same customer. This project numbering nomenclature was developed by NSPI and replaced at the beginning of 2011 with ENSC’s numbering nomenclature (“C-ZZZZ”). The second numbering nomenclature was found to be simpler and more consistent since the C&IC program is globally managed on a project-by-project basis, in contrast with a customer-by-customer management basis.

Upon the completion of the program tracking sheet review, the Evaluator identified a number of adjustments that could be made to improve its consistency and help program monitoring and evaluation. As the “Project” sheet of the tracking spreadsheet was, by far, the tracking tool that the Evaluator used the most, many of the recommendations particularly target this sheet. With this in mind, the Evaluator recommends that ENSC:

- > **Develop a standardized nomenclature to name the electronic files:** A nomenclature for naming project documents exist in the program manual but seems not to be systematically applied. In addition, the project name should include more information, such as the project

number, the document type (form 2, form 7, etc.) and the revision of the file. Many documents have the same name even though they do not pertain to the same project. This situation may be confusing, especially when the document is downloaded directly from the DSMDS.

- > **Continue standardizing the entries and fix limitations:** To avoid entering the same information in different ways, ENSC should continue integrating a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the likelihood of data entry errors. Below are typical examples where standardized entries and limitations would have been useful.
  - “Project Details” field: Inconsistencies were found in this column, such as “Lighting Retrofit” and “*Lighitng* Retrofit.” Moreover, a number of projects were defined as “Lighting/HVAC” while others were identified as “HVAC/Lighting.” Similarly, the Evaluator found a “Solar” project that was neither classified as a “Solar Hot Air” nor as a “Solar Hot Water” project.
  - “% Installed” field: When summing the percentage installed of each project for 2010 and 2011, the Evaluator noted that several projects appeared as if they had been more than 100% installed.
- > **Split the customer name field in two columns:** At the time of conducting the tracking sheet evaluation, there was no project description column. There was only a “Customer Name” column which occasionally contained information that was more related to the project type than to customer identification (e.g. “Lighting Retrofit,” “Mechanical Cooling,” etc.). To reduce the likelihood of such errors, the Evaluator recommends creating a “Project Name” column that would contain any relevant description of the project. The PM should then ensure that the “Customer Name” field is fully dedicated to customer identification using standardized names. In other words, only standard customer names should be written in this column. With the new ENSC project numbering, the user cannot easily filter projects per program participant. The addition of this new “Project Name” column along with the standardization of “Customer Name” column entries would help address this issue.
- > **Add a new field for the savings at the consumer level:** At the time this report was written, the field for the 2011 installed energy savings (in kWh) was supposed to sum energy savings at the generator level (i.e., the sum of energy savings at the consumer level and related losses on the grid). In some cases, the Evaluator found that the energy savings entered in the tracking sheet were the same as the ones found in the M&V report, which do not take line losses into consideration. To reduce the risk of such errors, the Evaluator recommends adding a new column in the project tracking sheet to show energy savings at the meter independent from the



energy savings at the generator.<sup>5</sup> As the rate code of each C&IC participant is already included in the tracking sheet, an Excel function could automatically calculate the savings at the generator. Furthermore, the existing energy savings field should be clearly identified as being “at the generator level.”

- > **Split the demand savings field in two different columns:** In the C&IC program tracking sheet, the “installed demand savings” field contains figures that may be either in kW or kVA, depending on the tariff rate of the customer. This situation leads to a major bias when the users want to sum the figures of this column, regardless of each customer’s rate code. The kW and kVA figures will be very similar when the power factor of the measure is almost 1. However, when implementing the measure significantly improves the equipment power factor, the kVA and kW figures may be very different. For instance, the feasibility study of an uninterruptible power supply replacement project estimated the apparent demand savings at 84.5 kVA while the estimated real demand savings were only 8.5 kW (ten times less). Moreover, entry errors are more likely to occur when a field can contain data using different units (kW or kVA). Therefore, the Evaluator recommends splitting this installed demand savings column in two to differentiate the installed demand savings in kW and kVA, respectively. In addition, the demand savings in the kW field should be systematically entered for all projects, whereas data may be entered in the kVA field only when they are available.

#### **4.2.3 Program Design and Implementation**

In 2011, the C&IC program was significantly upgraded with regard to several aspects. During the interview with the PM, the Evaluator noted the following key improvements from the 2010 program evaluation:

- > Program staffing has been improved to alleviate bottlenecks and reduce the likelihood of data entry errors in the tracking sheet.
- > The verified total peak demand savings were under target in 2010. Consequently, the C&IC program focused on new larger projects (with high demand savings potential) and examined more closely the project applications in 2011, with the aim of fostering the realization of peak demand savings for this period.
- > The activities of the sales leads were included in the C&IC program in 2011. Accordingly, the PM is now able to monitor the sales leads with performance indicators and can therefore determine their effectiveness in terms of realization ratios. The use of such ratios is considered a very good practice.

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<sup>5</sup> A number of projects involve the use of multiple rate codes. In such cases, ENSC should use a weighted average of the line loss factor of each facility included in the project. A note should also be added to keep track of this calculation. Nonetheless, this situation is not likely to happen often (for 2011, no project involves the use of more than one line loss factor per project).

- > Within the website material, there is a program overview chart that describes the different project phases along with the documents needed. Such a chart should help participants understand the different phases of a rather complex program as well as all related forms. This is considered an excellent initiative.

As shown in the previous list, a number of relevant enhancements to program design and implementation have been integrated into the C&IC program in 2011. Nevertheless, several program aspects captured the Evaluator's attention. With the aim of improving further activities and impacts of the C&IC program, the Evaluator recommends the following:

- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. The Evaluator strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Track the number of energy audits that are not accepted:** For program performance purposes, ENSC should track the number and relevant details of the energy audits submitted for review that it decides not to accept under the C&IC program. If there are too many such audits (e.g. more than 10 percent), that may mean that the eligibility criteria are unclear and should be adjusted. This could also indicate potential issues with the consultants who conducted the energy audits. At the end of 2011, ENSC mentioned that they had already started working on a system to track energy audits that are not accepted.
- > **Standardize the internal screening process:** Free-ridership is an important concern for the C&IC program. Through the C&IC project participation process, free-ridership is currently being screened based on the customer's investment criteria. The program manual also presents a list of free-ridership screening questions used by ENSC at the early stage of a project. However, ENSC does not compile systematically in a centralized file the names and answers of program participants who are screened out due to free-ridership. With the aim of making this internal screening process more efficient, Econoler recommends that ENSC develop tailored tracking mechanisms for collecting and recording all answers from potential participants with respect to free-ridership screening questions. ENSC would thereby be able to analyze the answers of participants who are screened out and could make proper adjustments to program process (target marketing activities, make ineligible several measures that are now considered as standard practices). The program tracking sheet could also contain a note (if worthwhile) for participants with a potential for free-ridership.

#### **4.2.4 Section of ENSC Website**

Commercial, institutional and industrial customers can easily consult the ENSC website to seek information on the programs offered. More specifically, the C&IC section of the ENSC website provides information on the program process (description and how to participate), eligible energy efficiency opportunities and potential incentives.

Moreover, the website shows an online video of a program participant who testifies of their positive experience with the program. The website also provides all program material in one package. In addition to the application forms and program overview document, this package includes a well-detailed guide for developing the feasibility study along with a short example. The Evaluator considers that providing this complete package to potential participants is a great asset for the program website. As part of this package, there is a prescriptive form for submitting a summary of the scoping study for approval. The fact that ENSC developed such a prescriptive template is another excellent initiative. This standardized summary allows for a quick and complete picture of the scoping study contents. It also facilitates the data mining from these forms without going through the whole project report.

After having reviewed the C&IC program section of the ENSC website, the Evaluator recommends the following improvements:

- > **Add more eligible customers in the “Who Is Eligible” section:** In the “Who Is Eligible” section, ENSC should add industrial sector companies to the commercial businesses. This section should also mention the large institutional customers as eligible customers since the C&IC program targets hospitals, universities and regional school boards as well.
- > **Supplement the ENSC website with information taken from Appendix H of the C&IC program manual:** Appendix H of the program manual, intended to facilitate staff training, is a very good initiative in case there are changes of program staff. Some components of this appendix could be used in a frequently asked questions (FAQs) section dedicated to the C&IC program on the ENSC website.
- > **Change the title of the “Nova Scotia Power On-Bill Financing” section for potential participants that are not directly supplied by NSPI:** In the “Nova Scotia Power On-Bill Financing” section, referring only to the NS Power bill could result in clients of independent municipal electric utilities not understanding that they can also benefit from on-bill financing. To avoid confusion, the title of the section could be “Electricity Bill Financing” and additional information could be given for customers served by municipal electric utilities.

#### **4.2.5 Interview with a Verification Partner**

Under the C&IC program the key role of the verification partner, who is an external consultant, is to help clients access the ENSC program and support the program technical staff in reviewing feasibility studies and audits, verifying technical calculations, metering and verification activities as well as conducting project inspections.

The verification partner's satisfaction with the overall C&IC program is very high. The satisfaction level towards their relationship with the PM, the program coordinator and the program technical support staff is also very high.

The program seems to function well from an operational point of view. The participation process in the program is qualified as simple and easy, and the verification partner also declared that any mid-course modification requires minor changes to the way they operate. Furthermore, the number of parties and organizations participating in the program is considered adequate, and the verification partner has received no complaint from participants or other program partners.

To improve program performance, the verification partner suggested that ENSC keep encouraging clients to participate in the program since the main barrier is the lack of awareness of the program on the part of industrial and commercial clients. This suggests that perhaps the marketing activities should be enhanced even if the verification partner expressed a high level of satisfaction with the marketing and outreach activities.

### **4.3 CINC PROGRAM PROCESS EVALUATION**

This section presents the key outcomes from the process evaluation performed by the Evaluator for the CINC program. This process evaluation relied upon in-depth interviews conducted with the PM and the program partners, as well as on an in-depth interview with a program participant. Because the program was new, only nine projects were completed in 2011. One in-depth interview with a program participant was hence deemed to be sufficient for evaluation purposes. The interview guides are the same as those used for the C&IC program process evaluation and can be found in Appendices IV, V and VI.

#### **4.3.1 Program Manual Content**

The program features a manual that contains information for internal use by program staff (additional information is outlined in Section 4.2.1). As with the process evaluation of the C&IC program, the next table highlights the key information contained in the CINC program manual in comparison with typical details that are generally included in program manuals.

**Table 5: CINC Program Manual Content Evaluation**

| Program Manual Content                                                                                                                   | CINC Program Manual |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Document revisions                                                                                                                       | ✓                   |
| Program description (including nature or type of program)                                                                                | ✓                   |
| Program justification                                                                                                                    | ✓                   |
| Program objectives                                                                                                                       | ✓                   |
| Incentives                                                                                                                               | ✓                   |
| Eligibility criteria                                                                                                                     | ✓                   |
| Program partners and their roles                                                                                                         | ✓                   |
| Program barriers                                                                                                                         | ✓                   |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects)                             | N/A                 |
| Details about the savings calculations and type of measures                                                                              | N/A                 |
| Budget per year                                                                                                                          | ✓                   |
| Cost-effectiveness test results                                                                                                          | ✓                   |
| Market study or technical study that supports program elements or assumptions                                                            | ⊘                   |
| Marketing plan                                                                                                                           | ✓                   |
| Evaluation plan                                                                                                                          | ⊘                   |
| Program theory                                                                                                                           | ⊘                   |
| Logic model                                                                                                                              | ✓                   |
| Program process flow chart                                                                                                               | ✓                   |
| Partner or participant process flow chart                                                                                                | ✓                   |
| Program forms                                                                                                                            | ✓                   |
|  Information included in the program manual           |                     |
|  Information partially included in the program manual |                     |
|  No information                                       |                     |

After the completion of the CINC program content analysis, the Evaluator established the following list of comments and recommendations that aim to improve the program manual structure and contents:

- > **Define the expression “artificially-low baseline”:** In Section 3.2 of the Feasibility Guide (Appendix B), the expression “artificially-low baseline” is written in a yellow textbox. It would be preferable to define this expression and give an example of what it refers to.
- > **Develop a short standard form to include in the Executive Summary of the feasibility study of NCWB projects:** In regards to the Executive Summary of the feasibility study (point 6.2 of Appendix B), it is recommended that ENSC have a one-page compulsory standard form for all NCWB projects that would outline the key information of the feasibility study. Similar to the one required in the C&IC program, this document could give a quick overview of **each** project and be very useful for data mining purposes.
- > **Provide the parameters used for estimating the program objectives:** The program objectives are forecast in terms of net savings. This means that they include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the gross savings. These parameters should be documented in the program manual so that the PM and the Evaluator can keep track of the assumptions used to estimate the program targets. After each evaluation, these parameters are adjusted accordingly for estimating the program objectives of the years to come.
- > **Standardize the use of terms in Section 4.3.3:** In Section 4.3.3 of the program manual (Feasibility Study Incentive – Whole Building & Custom Paths), the Evaluator recommends always using the same terminology to designate a product or activity. In this case, the program manual uses alternatively the terms energy audit and feasibility study. Using the same terms for the same activities all along the document should reduce confusion.
- > **Provide program participants with a printable version of the CPG:** If possible, the Evaluator recommends providing the program participants with a printable copy of Appendix H of the program manual, i.e., the CPG. Since this guide is a key reference tool for participants who follow the NCCP, it would be useful for them to have paper copies of the PDF document.

In conclusion, the Evaluator notes that, even though the program manual is well written, additional information is needed to serve as “program memory,” which is useful in case of modifications or staff changes. Furthermore, as in the C&IC recommendation, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.

#### **4.3.2 Program Tracking Sheet**

Under the program process evaluation, Econoler reviewed the structure and contents of ENSC's CINC program tracking sheet. All in all, the tracking sheet is useful to the PM and provides a way to continuously monitor program activities. In general, all fields essential to program administration are present. The necessary details for program administration and evaluation purposes are generally already present, although a number of improvements to enhance the efficiency of the tool are recommended.

The CINC program tracking information essentially stands on a one-sheet spreadsheet. At first glance, this tracking tool shows minimal reference information on the project, such as the project identification number, name, location, contact person name and status (including the forecast month and year of completion). In addition, this tracking tool shows the estimated size of the building to be built (both in square metres and square feet), which is essential for the calculation of the forecast energy savings and financial incentive under the NCCP path. These last two details, namely the energy savings per project and the potential financial incentive, are also included in the spreadsheet. Finally, the tracking sheet contains a verification field whose value may be either yes/no for the NCWB path or N/A (not available) for the NCCP path.

As mentioned previously, the energy savings of NCCP projects are calculated using an energy saving coefficient per floor area. More precisely, the average value used in the tracking sheet is approximately 56 kWh/m<sup>2</sup> (5.2 kWh/ft<sup>2</sup>), which is based on the simulations conducted by the Advanced Buildings Institute (ABI). This figure is applied to all CPG-compliant buildings, regardless of overall size, configuration or usage. For the NCWB projects, the energy saving coefficient is also used as a placeholder estimate until either the energy modeling validation is completed or if the feasibility study shows a substantial difference with ABI's figure. At this time, the cell value is updated to reflect the calculated energy modeling results.

Upon completion of the program tracking sheet review, the Evaluator identified a number of adjustments that could be made to improve its consistency and help program monitoring and evaluation. With this in mind, the Evaluator recommends that ENSC:

- > **Create automatic formulas for calculating data that are dependent on data of other fields:** In tracking systems, it is a good practice to create automatic links in fields where information is dependent on the information written in another field. This practice reduces the number of entries to be keyed in by the users and thus decreases the likelihood of data entry errors. In the CINC tracking database, one column calculates the financial incentives of each project, depending on the program path taken (NCCP or NCWB). Considering that another column already states which CINC program path is taken to conduct the project, the Evaluator recommends creating a function in the "Potential Incentives" column that would automatically calculate the potential incentive for each project based on the chosen program path.

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- > **Standardize the entries and fix limitations:** To avoid entering the same information in different ways, ENSC should integrate a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the likelihood of data entry errors. Here are typical examples where standardized entries would have been useful:
    - “Path” column: There are two choices that could be entered here, i.e., EM (“Energy Modeling”) for the NCWB path or CP (“Core Performance”) for the NCCP path. Here, the use of a drop-down list would help avoid typo errors. Incidentally, ENSC should also consider using the same acronyms for defining the project path as those used in the program manuals, i.e., NCCP and NCWB instead of CP and EM.
    - “Status” column: As per its name, this field aims to identify the project progress status. Nevertheless, the project status options used here vary. The Evaluator recommends defining a short list (four to seven) of typical project status options in accordance with the program process charts to be found in the program manual. This would ease the follow-up of each project and quickly assess the overall program status. Then, ENSC could add another column to add any additional relevant comments on the project status.
    - “Finish Month” column: This column is another example of a field in which the information could be easily standardized to alleviate data entry errors.
  - > **Add a peak demand savings field:** The CINC tracking sheet shows the amount of energy savings to be achieved for each project. Nevertheless, there is no column to track the peak demand savings. It is not possible to calculate demand savings for NCCP path participants using ENSC’s impact calculation methodology. On the other hand, ENSC could compile demand savings for participants using the NCWB path since this information should be available from the feasibility study. Consequently, the Evaluator recommends adding a column in the tracking sheet to follow these peak demand savings.
  - > **Track the market type of each customer:** The PM should consider adding the market sector of each customer (e.g. “Commercial,” “Industrial,” “Institutional,” etc.) for tracking purposes. This additional information could also help quickly identify which market sectors contribute the most to the program and adapt the marketing strategy accordingly.
  - > **Add customer contact details in the tracking sheet:** The Evaluator recommends adding customer contact details (phone number, email, etc.) in the same tracking tool as the one used to follow up on project progress and program impacts. This information can be entered either in the same sheet as the energy saving data or in a separate sheet of the same spreadsheet.
  - > **Break down the address information:** Currently, the address information (“Location” column) for each client is contained in one cell. This complicates site selection based on location for field activities. Presenting the address information in three cells (street address, city and postal code) will greatly facilitate this process.



### **4.3.3 Program Design and Implementation**

The CINC program was launched in October 2010. To date, no major adjustment has been made to its design and implementation process. Since its creation, the program seems to be going well. In 2010, only two new construction projects, which had been enrolled in the C&IC program prior to the launch of the CINC program, contributed to the total impacts of the C&I Custom programs. In comparison, nine projects were completed in 2011 and more than 21 other projects were planned to be completed in the upcoming years.

As mentioned previously in this report, there are three distinct paths for conducting a project under the CINC program. Accordingly, the implementation process may vary depending on the program path followed. For example, the PDA signature is required before starting the construction of a project using the NCWB approach, while a number (if not all) of the energy efficiency measures may be installed before the PDA is completed under the NCCP path. Therefore, the CINC project management workload on ENSC's side is high due to the fact that each project is customized.

When conducting the on-site visits, the Evaluator noticed that the M&V step of the program process seemed to be an issue on the participant side, especially for the projects made under the NCCP path. In fact, program participants are usually building owners that are not aware of all the building construction details (HVAC and lighting technical specifications, building envelope components, etc.). For any technical matters, they must refer to the contractors, architects and/or engineers who designed and built the energy-efficient building. Throughout the building design and construction process, the design-build firms (i.e. contractors, architect or engineering firms) do not automatically collect and keep record of all the required documentation for demonstrating new building compliance with the CPG.<sup>6</sup> Moreover, the design-build firms have low interest in providing ENSC with all the required documentation since they have no mandatory agreement to fulfill with ENSC and they will not directly receive the financial incentive. These concerns may explain why ENSC has experienced challenges collecting minimum requirement documents for performing M&V.

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<sup>6</sup> For instance, one of the contractors met during the on-site visits mentioned that he had to draft an Indoor Air Quality (IAQ) Construction Management Plan along with a flush-out plan, even though the building was now constructed and fully operational. These two plans were not written prior to building construction. The contractor was therefore forced to develop such documents only to comply with the CPG.

With the aim of improving further activities and impacts of the C&IC program, the Evaluator recommends the following:

- > **Adjust the eligibility criteria to include projects that partly comply with the CPG because of specific situations:** The program may be adapted to include projects that partly comply with the CPG but which cannot fully comply because of specific corporate requirements. For instance, the Evaluator met with a car retailer who was starting a new construction project. This new building was to be used for retailing luxury cars of a brand that had its specific and non-negotiable standards for indoor lighting level and technology. The former program participant told the Evaluator that he was interested in applying to the CINC program for this upcoming building construction project, but he decided not to do so because he knew in advance that he would not be able to comply with the CPG requirements on lighting power density (Criterion 2.7). Accordingly, the Evaluator recommends considering the development of a methodology to make eligible new constructions that may partly comply with the CPG but cannot fully comply due to a particular situation. ENSC should also define adjustments to the incentives and energy savings to be calculated. Nevertheless, such projects should comply with at least a minimum number of Core Performance Requirements to be eligible for the CINC program. As the CPG is built as a package, ENSC also mentioned that it was already exploring options for another tool that would perform comparable house simulations.
- > **Develop an evaluation plan in parallel with program design and development:** This program has no evaluation plan. The Evaluator strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.
- > **Compare the actual building consumption with the design simulations and make appropriate adjustments (if required):** In regard to M&V activities that are undertaken up to three years following program completion, the Evaluator recommends comparing the building real consumption to the modeling results. This will help assess the level of discrepancy between simulation and reality, and adjust the software if necessary. If the program allows the use of different software, this comparison could help identify which one is closest to reality. It was mentioned that ABI would do this comparison for the projects undertaken under the NCCP path when data are available.

- > **Set performance indicators on project delivery process:** In different sections of the program manual there are references to time limits to perform a given task. With the aim of evaluating project delivery process efficiency, ENSC should establish performance indicators to monitor if such tasks are completed within the time frame predicted in the program theory.
- > **Clearly define the CPG minimum requirements at the early stage of the CINC projects:** As mentioned earlier in this section, the Evaluator noticed that the M&V step of the program process was an issue for program participants who conduct their projects under the NCCP path. The verification partner met during the process evaluation also highlighted this matter but mentioned that they were currently working jointly with the PM to specify in more detail the minimum documents required to reach CPG compliance. With this in mind, the Evaluator recommends providing the participants with the standardized minimum requirements document as soon as possible in the project process (at least before starting the construction work). Moreover, the Evaluator encourages ENSC to add more detail to the minimum requirements documents as well as to draw up a set of examples and/or templates of requirement documents that would comply with the CPG. This could help the participants ensure that they prepare and provide the proper documentation.
- > **Consider adding a commissioning component to the program:** The Evaluator believes that ENSC should consider promoting building commissioning in the program since it has been proven that an effective commissioning contributes to achieving the savings predicted by the modeling. The CPG already includes an enhanced building commissioning component that could be used.

#### **4.3.4 Section of ENSC Website**

Commercial, institutional and industrial customers can easily consult the ENSC website to seek information on the programs offered. More specifically, the CINC section of the ENSC website provides information on the program process (description and how it works), the eligible paths (NCCP and NCWB) as well as the contact details to obtain more information and submit projects.

After having reviewed the CINC program section of the ENSC website, the Evaluator recommends the following small improvement:

- > **Change the description of the CPG:** On the second page of the program fact sheet, the CPG is referred to as a flexible program. The Evaluator considers that the CPG is more a tool than a program, and that the wording should be changed accordingly to avoid confusion.

### 4.3.5 Interview with a Verification Partner

The CINC program is relatively new and the verification partner who reviews energy model submissions and provides technical assistance to program participants did not have much experience with the program (three months) at the time of the interview.

The level of satisfaction of the verification partner with the overall CINC program is rather high. The slight restraint expressed by the partner in relation to their level of satisfaction is explained by the fact that program requirements are still being developed. The verification partner is now providing support in developing these requirements, which was not part of their initial scope of work. However, their relationship with ENSC's team is very well rated, notably because of the support given by the PM and the receptivity of the latter to the concerns raised by the verification partner.

The verification partner identified the main barrier to the program as the necessity to develop a set of guidelines for energy submissions regarding the software to be used and the documentation requirements; an issue that is currently being addressed by the PM. According to the verification partner, offering a commissioning component to several projects and calibrating the modeling tools with actual building consumption are also two measures that could enhance program performance.

## 4.4 PARTICIPANT PERSPECTIVES

### 4.4.1 Previous Program Participation

Four in 10 respondents (44%) participated in other NSPI or ENSC programs prior to participating in the C&IC program. Of the 12 respondents who participated in previous NSPI or ENSC programs, seven report participating in the Small Business Lighting Solutions program (now named Small Business Energy Solutions).

**Table 6: Participated in other Programs<sup>7</sup>**

| Participated in Other NSPI or ENSC Programs | 2008      | 2009      | 2010      | 2011      |
|---------------------------------------------|-----------|-----------|-----------|-----------|
| <i>Sample Size</i>                          | <i>11</i> | <i>13</i> | <i>13</i> | <i>27</i> |
| Yes                                         | 9%        | --        | 8%        | 44%       |
| No                                          | 91%       | 100%      | 92%       | 52%       |
| Don't know                                  | --        | --        | --        | 4%        |

<sup>7</sup> Results for 2008, 2009 and 2010 are presented as frequencies (#) since the number of respondents is very low, whereas most 2011 results are presented as percentages (%).

#### 4.4.2 Program Awareness

Participants were asked how they had learned about the C&IC program. The table below shows that they heard about the C&IC program in a number of ways. Through a contractor or vendor (22%) or through ENSC staff (22%) are the top ways followed by an ENSC presentation (19%) or the ENSC website (19%). Other mentions include from someone who previously participated in the program (11%), from the Dalhousie Eco Efficiency Centre (7%), from when NSPI ran the program (7%), from ENSC literature (4%) or from word of mouth (4%).

**Table 7: Source of Awareness of C&IC Program**

| Source                                                                                                                                                      | 2008<br>(#) | 2009<br>(#) | 2010<br>(#) | 2011*<br>(%) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|--------------|
| <i>Sample Size</i>                                                                                                                                          | <i>11</i>   | <i>13</i>   | <i>13</i>   | <i>27</i>    |
| Contractor/vendor                                                                                                                                           | 4           | 6           | 1           | 22%          |
| ENSC staff                                                                                                                                                  | 2           | --          | 1           | 22%          |
| ENSC presentation                                                                                                                                           | 1           | 3           | 2           | 19%          |
| Internet/ENSC website                                                                                                                                       | --          | 8           | 1           | 19%          |
| Someone in program/word of mouth                                                                                                                            | 2           | 2           | 2           | 15%          |
| From Eco Efficiency Centre                                                                                                                                  | --          | --          | --          | 7%           |
| From when NSPI ran the program                                                                                                                              | --          | --          | --          | 7%           |
| ENSC literature                                                                                                                                             | 1           | --          | 1           | 4%           |
| Recreation Facility Association                                                                                                                             | --          | --          | 3           | --           |
| Trade show                                                                                                                                                  | --          | --          | 1           | --           |
| Researched something similar in Manitoba                                                                                                                    | 1           | --          | --          | --           |
| Other                                                                                                                                                       | --          | --          | --          | 4%           |
| Don't know                                                                                                                                                  | --          | 1           | 1           | --           |
| <i>*2011 questions included 'Yes/No' response categories and therefore allowed multiple mentions, while previous years were a single response question.</i> |             |             |             |              |

### 4.4.3 Participant Motivations and Barriers

When asked about their reasons for participating in the C&IC program, the majority of 2011 respondents (66%) reported saving on energy costs/bills as a primary or secondary motivation, with six in 10 (59%) citing this as their primary motivation. Three in 10 mentioned taking advantage of program incentives (30%), followed by wanted to improve existing lighting conditions (7%). These findings are consistent with previous results from 2010, 2009 and 2008. However, in 2011, quite a few participants mentioned that they wanted to protect the environment (22%) or to improve energy efficiency (15%) as their secondary motivation.

ENSC should continue to focus on the financial benefits of the program since savings on energy cost and program incentives are still the main participant motivations.

**Table 8: Participant Motivations**

| Motivations                                  | 2008                      |                                  | 2009                      |                                  | 2010                      |                                  | 2011                      |                                  |
|----------------------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|
|                                              | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation |
| <i>Sample Size</i>                           | 11                        | 11                               | 13                        | 13                               | 13                        | 13                               | 27                        | 27                               |
| Save on energy/energy costs                  | 5                         | 2                                | 6                         | 6                                | 10                        | 1                                | 59%                       | 7%                               |
| Incentives                                   | 6                         | 4                                | 4                         | 2                                | 1                         | 3                                | 30%                       | 15%                              |
| Improve existing lighting conditions         | --                        | 1                                | --                        | 1                                | --                        | --                               | 7%                        | 11%                              |
| Past participation in other utility programs | --                        | --                               | --                        | --                               | --                        | --                               | 4%                        | --                               |
| Protect environment                          | --                        | --                               | 2                         | 1                                | 1                         | 1                                | --                        | 22%                              |
| Energy efficiency                            | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 15%                              |
| Replace non-operational equipment            | --                        | --                               | --                        | --                               | --                        | 1                                | --                        | 4%                               |
| It was part of an already planned project    | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 4%                               |
| Reduce maintenance costs                     | --                        | 1                                | --                        | --                               | 1                         | --                               | --                        | --                               |
| Reduce carbon footprint                      | --                        | --                               | --                        | --                               | --                        | 2                                | --                        | --                               |
| Ease of program participation                | --                        | 2                                | --                        | 1                                | --                        | --                               | --                        | --                               |
| Other                                        | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 11%                              |
| Refused                                      | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 4%                               |
| Don't know                                   | --                        | 1                                | 1                         | 2                                | --                        | 2                                | --                        | 7%                               |

Similar to previous years' finding, the majority of participants did not identify any barriers to C&IC program participation (74%). From the seven respondents who reported barriers, three of them mentioned that the approval was taking too long, one mentioned that the energy efficiency equipment did not meet payback requirements and one mentioned the required measurement as a barrier to participation.

**Table 9: Barriers to Program Participation**

| Barriers                                                   | 2008                   |                               | 2009                   |                               | 2010                   |                               | 2011                   |                               |
|------------------------------------------------------------|------------------------|-------------------------------|------------------------|-------------------------------|------------------------|-------------------------------|------------------------|-------------------------------|
|                                                            | Most Important Barrier | Second Most Important Barrier | Most Important Barrier | Second Most Important Barrier | Most Important Barrier | Second Most Important Barrier | Most Important Barrier | Second Most Important Barrier |
| Sample Size                                                | 11                     | 11                            | 13                     | 13                            | 13                     | 13                            | 27                     | 27                            |
| No barriers                                                | 6                      | 6                             | 7                      | 7                             | 9                      | 9                             | 74%                    | 74%                           |
| Approval took too long                                     | --                     | --                            | --                     | --                            | --                     | --                            | 11%                    | --                            |
| Payback timeframe                                          | --                     | --                            | 1                      | --                            | 1                      | --                            | 4%                     | --                            |
| Measurement                                                | --                     | --                            | --                     | --                            | --                     | --                            | 4%                     | --                            |
| Contractor communications                                  | --                     | --                            | --                     | --                            | 1                      | --                            | --                     | --                            |
| Remote location                                            | --                     | --                            | --                     | --                            | 1                      | --                            | --                     | --                            |
| Communicating savings                                      | 1                      | --                            | --                     | --                            | --                     | --                            | --                     | --                            |
| Believing they were there to help us                       | 1                      | --                            | --                     | --                            | --                     | --                            | --                     | --                            |
| Integrating                                                | 1                      | --                            | --                     | --                            | --                     | --                            | --                     | --                            |
| Time of day (work done at night)*                          | 1                      | --                            | --                     | --                            | --                     | --                            | --                     | --                            |
| Voltage change*                                            | 1                      | --                            | --                     | --                            | --                     | --                            | --                     | --                            |
| Explaining the operation and principles behind the project | --                     | 1                             | --                     | --                            | --                     | --                            | --                     | --                            |
| Lack of personnel                                          | --                     | --                            | 2                      | --                            | --                     | --                            | --                     | --                            |
| Contract language                                          | --                     | --                            | 1                      | --                            | --                     | --                            | --                     | --                            |
| Consultant error                                           | --                     | --                            | 8                      | --                            | --                     | --                            | --                     | --                            |
| Complicated communication                                  | --                     | --                            | 8                      | --                            | --                     | --                            | --                     | --                            |
| Legal issues                                               | --                     | --                            | --                     | 1                             | --                     | --                            | --                     | --                            |
| Other                                                      | --                     | --                            | --                     | --                            | --                     | --                            | 7%                     | --                            |
| Don't know                                                 | --                     | 4                             | --                     | 3                             | 1                      | 4                             | --                     | 26%                           |

\* These are not program-related barriers.

#### 4.4.4 Energy Attitudes

The vast majority of respondents believe it is important to reduce energy usage (93%) and all of them believe it is important to manage energy costs (100%) at their organization. These results are similar to previous years'.

**Table 10: Importance of Energy Management**

| Aspect                                                                                               | 2008 | 2009 | 2010 | 2011 |
|------------------------------------------------------------------------------------------------------|------|------|------|------|
| <i>Sample Size</i>                                                                                   | 11   | 13   | 13   | 27   |
| Reducing energy usage                                                                                | 11   | 12   | 12   | 93%  |
| Managing energy costs                                                                                | 11   | 12   | 12   | 100% |
| Those giving a rating of 5 or 4 on a scale where 5= 'very important' and 1 = 'not at all important.' |      |      |      |      |

#### 4.4.5 Organizational Decision Making

Seventy-five percent of respondents reported that someone outside their organization took most of the responsibility for specifying the measures that were implemented through the program. Similar to 2009 and 2010 findings, design professionals (30%) and contractors (30%) are listed as parties most often responsible for specifying the measures implemented. Therefore, contractors and design professionals represent channels that may be effectively utilized to promote the program.

**Table 11: Party Most Responsible for Specifying Measures**

| Parties Responsible for Specifying Measures | 2008 | 2009 | 2010 | 2011 |
|---------------------------------------------|------|------|------|------|
| <i>Sample Size</i>                          | 11   | 13   | 13   | 27   |
| Outside design professional                 | 2    | 6    | 6    | 30%  |
| Contractor                                  | 4    | 4    | 3    | 30%  |
| Manufacturer representative                 | 2    | 1    | 1    | 15%  |
| Someone within the organization             | 2    | 1    | 1    | 15%  |
| Utility account manager                     | 1    | --   | 1    | --   |
| Don't know                                  | --   | 1    | 1    | 4%   |
| Other                                       | --   | --   | --   | 7%   |



#### 4.4.6 Program Influence

The incentives or on-bill financing are the most important factors influencing the decision to install energy efficiency measures through the program (mean score of 8.4). The funded preliminary energy audit is considered moderately important (mean score of 6.7), followed by the technical assistance offered by the program during project implementation and the M&V process (mean score of 6.4). In addition, the recommendations and technical assistance provided by the program when the company was engaged in discussions with contractors and consultants about equipment choices is also considered moderately important (mean score of 6.3). The same applies to the organization's corporate policy or guidelines regarding purchase of equipment (mean score of 6.3). Previous experience with the custom program (mean score of 4.7), the standard practice of the industry (mean score of 4.6) and the existing energy efficiency code (mean score of 4.1) are deemed less important.

**Table 12: Program Influence**

| <b>Importance of Program in Influencing Decision to Implement Energy Efficiency Measures</b>                                                                         | <b>2011</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <i>Sample Size*</i>                                                                                                                                                  | 27          |
| Mean (0=Not at all important, 10=Extremely important)                                                                                                                |             |
| Program financial incentives and/or on-bill financing                                                                                                                | 8.4         |
| Funded preliminary energy audit scoping study                                                                                                                        | 6.7         |
| Technical assistance offered by the program during project implementation and the M&V process                                                                        | 6.4         |
| Recommendations and technical assistance provided by the program when my company was engaged in discussions with contractors and consultants about equipment choices | 6.3         |
| Your company's or organization's corporate policy or guidelines regarding the purchase of equipment                                                                  | 6.3         |
| Previous experience with the C&IC program or a similar program either from ENSC or NSPI                                                                              | 4.7         |
| Standard practice in your industry                                                                                                                                   | 4.6         |
| Existing energy efficiency code                                                                                                                                      | 4.1         |
| *Note: Don't know responses removed from data.                                                                                                                       |             |

#### 4.4.7 Satisfaction with the Program

All respondents are satisfied with the program overall (100%). The vast majority of respondents are also satisfied with the availability of program staff (89%), the scoping study (preliminary energy audit) rebate amount (87%), interaction and communication with program staff (85%), the initial confirmation of eligibility (85%) and the incentive amount for the feasibility study (85%). Compared with 2010 findings, respondents are more likely to be satisfied with the interaction and communication with staff and consultants since these specific aspects of the program might have been problematic last year due to the change from NSPI to ENSC. Noteworthy is that in 2011, verification received the lowest score of satisfaction with only 53 percent.

**Table 13: Participant Satisfaction with Program**

| Aspect of Program                                                                                           | 2008     |                  | 2009     |                  | 2010     |                  | 2011     |                    |
|-------------------------------------------------------------------------------------------------------------|----------|------------------|----------|------------------|----------|------------------|----------|--------------------|
|                                                                                                             | <i>n</i> | <i>Satisfied</i> | <i>n</i> | <i>Satisfied</i> | <i>n</i> | <i>Satisfied</i> | <i>n</i> | <i>% Satisfied</i> |
| Program overall                                                                                             | 11       | 10               | 13       | 13               | 13       | 10               | 27       | 100%               |
| Availability of program staff                                                                               | 11       | 10               | 12       | 11               | 12       | 8                | 27       | 89%                |
| Preliminary energy audit/scoping study rebate amount                                                        | 9        | 8                | 11       | 10               | 12       | 10               | 27       | 87%                |
| Interaction and communication with program staff                                                            | 11       | 9                | 12       | 12               | 13       | 6                | 27       | 85%                |
| Initial confirmation of eligibility                                                                         | 11       | 11               | 13       | 12               | 12       | 8                | 27       | 85%                |
| Feasibility study/assessment incentive amount                                                               | 7        | 7                | 12       | 12               | 12       | 10               | 27       | 85%                |
| Feasibility study/assessment                                                                                | 7        | 7                | 12       | 10               | 13       | 9                | 27       | 80%                |
| Interaction and communication with contractors/consultants                                                  | 9        | 9                | 12       | 9                | 12       | 4                | 27       | 79%                |
| Preliminary energy audit/scoping study                                                                      | 6        | 5                | 9        | 8                | 12       | 7                | 27       | 78%                |
| Project rebate amount                                                                                       | 10       | 9                | 10       | 10               | 13       | 10               | 27       | 77%                |
| Project implementation                                                                                      | 8        | 6                | 10       | 9                | 12       | 8                | 27       | 76%                |
| Paperwork and procedures required to receive rebate or incentives                                           | --       | --               | --       | --               | --       | --               | 27       | 70%                |
| Verification                                                                                                | 7        | 6                | 9        | 7                | 12       | 9                | 27       | 53%                |
| Those giving a rating of 5 or 4 on a scale where rating: 5= 'very satisfied' and 1 = 'not at all satisfied' |          |                  |          |                  |          |                  |          |                    |
| *Note: Don't know responses removed from data.                                                              |          |                  |          |                  |          |                  |          |                    |

#### 4.4.8 Participant Recommendations for Improvements

Respondents were asked if they had any recommendations to improve the C&IC program. One-third of respondents (34%) could not provide a suggestion for improvement. Twenty-two percent of respondents stated that the program was good or that everything was fine. A few participants (11%) seemed to be concerned with energy efficiency or energy savings and wished to see ENCS broadening the scope of energy savings to include other energy than electricity. Eleven percent of participants wished that things would move quicker and found that ENSC was understaffed while another 11 percent wished ENSC staff to increase their technical knowledge. Seven percent of respondents suggested increasing advertising/marketing and four percent suggested providing forms to be completed in an electronic format (not just as a PDF file).

**Table 14: Suggested Improvements to the C&IC Program**

| <b>Suggestions for Improvements</b>                                                                   | <b>2011</b> |
|-------------------------------------------------------------------------------------------------------|-------------|
| Sample Size                                                                                           | 27          |
| Everything was fine/satisfied with the program                                                        | 22%         |
| Broadening the scope of energy savings, including oil and fuel, other utilities, not just electricity | 11%         |
| More staff, more site visits to get things moving, quicker process                                    | 11%         |
| Increase staff technical knowledge                                                                    | 11%         |
| Increase advertising/marketing                                                                        | 7%          |
| Provide forms to be completed in an electronic format, not just as a PDF file                         | 4%          |
| Don't know/no suggestion                                                                              | 34%         |

When asked if a diagram illustrating the steps of the C&IC program would have facilitated participation in the program, two-thirds of respondents (67%) believed it would have done so significantly (30%) or somewhat (37%). This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the participation of future program participants.

**Table 15: Provision of a Diagram Illustrating Steps of C&IC Program**

| <b>Diagram Illustrating Steps of Program Would have Facilitated Participation</b> | <b>2011</b> |
|-----------------------------------------------------------------------------------|-------------|
| Sample Size                                                                       | 27          |
| Significantly                                                                     | 30%         |
| Somewhat                                                                          | 37%         |
| Slightly                                                                          | 19%         |
| Not at all                                                                        | 15%         |

## **5 IMPACT EVALUATION**

For the year 2011, the sum of forecast energy savings of the two C&I Custom programs (C&IC and CINC) accounted for approximately 30 percent of the total expected savings to be generated by all ENSC programs for the same period.

This section presents the work completed by the Evaluator to assess the actual impact (energy and peak demand savings) of the C&IC and CINC programs in 2011. The approach used by the Evaluator includes conducting on-site visits of sample projects and in-depth interviews with sample participants for both programs. Then, the Evaluator calculated the gross energy and peak demand savings for all sample projects, in accordance with the specifics of each project type. This calculation helped find the adjustment factors to be used to estimate the overall gross savings of both programs. Afterwards, the Evaluator determined the proper net-to-gross ratios (NTGR) to be applied for each program through the evaluation of free-ridership and internal spillover effects. Finally, the NTGR found for each program led to the calculation of the net energy and peak demand savings of the C&IC and CINC programs for 2011.

### **5.1 OBJECTIVES AND APPROACH OF THE IMPACT EVALUATION**

For the 2011 year, a total of 25 on-site visits were conducted to validate the actual impacts of the two program components in terms of energy and demand savings. These on-site visits aimed mainly to confirm the proper installation of energy-efficient equipment as well as to verify the assumptions made for the energy and demand savings calculations. Considering the respective size of each program component, the Evaluator made 23 on-site visits to C&IC projects and two on-site visits to CINC projects.

The sampling methodologies applied to the C&IC project selection were different than those to the CINC program, mainly due to the project specificities and to the level of information to be collected for each program. Hence, the next two sections present the sampling methodology for C&IC and CINC projects respectively. Moreover, Section 5.1.3 presents the protocols used by the Evaluator during on-site visits to program participants. Finally, Section 5.1.4 introduces the in-depth interviews that the Evaluator carried out for assessing internal spillover effects and participant satisfaction with the program.

#### **5.1.1 Sampling Methodology – C&IC Program**

At the beginning of October 2011, the tracking database of C&IC project savings included 146 projects which were expected to generate energy and peak demand savings at the generator by the end of 2011. The forecast total energy savings were almost 35 GWh while reductions of more than 3.8 MW of peak demand were expected from these projects. On the one hand, this list included completed

projects for which savings had already been verified and adjusted through measurement and verification (M&V). On the other hand, this list also included projects which were only at the feasibility study stage with no guarantee to be completed in 2011. It was therefore decided not to use the tracking list of 2011 projects to conduct the sampling for on-site visits but rather a shortlist of projects for which savings had already been verified by ENSC.

At the time of developing the sampling methodology and identifying the sites to be visited, a total of 40 projects had already had their energy and demand savings measured and verified under the C&IC program. This list included projects that were fully implemented in 2011 as well as 2010 projects which were completed in 2011 or projects to be completed in 2012 which had part of their forecast savings claimed and verified in 2011.

Table 16 presents additional details on savings claim status along with a breakdown of energy and peak demand savings at the generator for the 40 completed projects used for on-site visit sampling (as of October 2011).

**Table 16: Claimed Savings at the Generator of C&IC Measured and Verified Projects  
(as of October 2011)**

| <b>Savings Claim Status</b> | <b>Number of Projects</b> | <b>Tracked Gross Energy Savings at the Generator (GWh/yr)</b> | <b>Tracked Gross Peak Demand Savings at the Generator (MW)</b> |
|-----------------------------|---------------------------|---------------------------------------------------------------|----------------------------------------------------------------|
| Full Claim in 2011          | 34                        | 7.084                                                         | 0.824                                                          |
| Partial Claim in 2011       | 6                         | 3.862                                                         | 0.561                                                          |
| <b>Total</b>                | <b>40</b>                 | <b>10.948</b>                                                 | <b>1,385</b>                                                   |

The sampling for on-site visits was made from this population of 40 projects. The following series of criteria were used to identify the sample of 23 sites. The criteria are ranked by order of importance, the first one being the most important criterion applied for site selection:

- > project size;
- > source of the claimed savings – from M&V or Project Development Agreement (PDA);
- > type of project; i.e., the targeted energy end-use such as lighting, heating, ventilation and air conditioning (HVAC) systems, electrical motors and VSDs, etc.;
- > participant's market sector (commercial, municipal or industrial sector); and
- > project location.

With the use of the five sampling criteria, the Evaluator established the list of 23 sample projects to be visited. In January, the PM provided Econoler with the final list of projects to be considered for the calculation of 2011 program impacts. The next table shows an overall comparison of the sample projects and the total population of 159 C&IC projects taken into consideration for 2011.

**Table 17: Comparison of the Final Sample with the Population for the C&IC Program**

| Description | Number of Projects | Evaluated Gross Energy Savings at the Generator (GWh/yr) | Evaluated Gross Demand Savings at the Generator (MW) |
|-------------|--------------------|----------------------------------------------------------|------------------------------------------------------|
| Population  | 159                | 32.606                                                   | 4.047                                                |
| Sample      | 23                 | 8.801                                                    | 1.163                                                |

For reference purposes, the detailed sampling plan for the selection of C&IC on-site visits is presented in Appendix IX.

### 5.1.2 Sampling Methodology – CINC Program

In October 2011, eight projects were expected to be completed and approved under the CINC program by the end of 2011. A total of two on-site visits were planned for measuring and verifying the energy savings of the implemented measures. At the time of planning the on-site visits, the status of each CINC project was as shown below.

**Table 18: List of CINC Projects for 2011 and Respective Estimated Savings  
(as of October 2011)**

| No. | Program Path <sup>a</sup> | Location (city) | Project Status                  | Tracked Energy Savings at the Meter (kWh) | Percentage of Total Energy Savings |
|-----|---------------------------|-----------------|---------------------------------|-------------------------------------------|------------------------------------|
| 1   | NCCP                      | Antigonish      | Completed                       | 124,327                                   | 6.7%                               |
| 2   | NCCP                      | Stellarton      | Completed                       | 388,728                                   | 21.0%                              |
| 3   | NCWB                      | Halifax         | Under Construction <sup>b</sup> | 335,834                                   | 18.1%                              |
| 4   | NCCP                      | Dartmouth       | Completed                       | 126,218                                   | 6.8%                               |
| 5   | NCCP                      | Coldbrook       | Near Completion                 | 163,775                                   | 8.8%                               |
| 6   | NCCP                      | Bedford         | Completed                       | 119,600                                   | 6.5%                               |
| 7   | NCCP                      | Dartmouth       | Under Construction              | 475,765                                   | 25.7%                              |
| 8   | NCCP                      | Halifax         | Under Construction              | 117,206                                   | 6.3%                               |
|     |                           |                 | <b>Total:</b>                   | <b>1,851,452</b>                          |                                    |

<sup>a</sup> NCCP: New Construction Core Performance path, NCWB: New Construction Whole Building

<sup>b</sup> This project is the least likely to be completed in 2011 among all CINC projects under construction in 2011.

The following criteria were applied to establish the two sites to be visited:

- > Project status: The projects whose construction process was completed or almost completed were eligible for on-site visits. At the time of developing the sampling methodology, only four out of the eight projects had been fully completed.
- > Project size: The list of eight projects was divided into two groups with regard to their respective amount of estimated energy savings. One project was selected in each of the two categories, which were defined as follows:
  - Projects whose expected energy savings are lower than 300,000 kWh/year: Five projects are included in this group and their potential energy savings account for 35 percent of the total energy savings of the programs (651,126 kWh/year out of the 1,851,452 kWh/year).
  - Projects whose expected energy savings are higher than 300,000 kWh/year: Three projects are included in this group and their potential energy savings account for 65 percent of the total energy savings of the programs (1,200,327 kWh/year out of the 1,851,452 kWh/year).
- > Project location: For logistical purposes, the projects located more than 20 km away from the following large urban areas were removed from the sample. Only Project #002, which is located in Antigonish, did not comply with this criterion.
  - List of eligible urban areas: Halifax (Halifax County), Kentville (Kings County), New Glasgow (Pictou County) and Sydney (Cape Breton County).

After the application of the above three sampling criteria, the two projects to be visited were randomly selected. In January 2012, ENSC confirmed that nine projects had to be considered for the 2011 program impact calculations. The next table shows an overall comparison of the sample with the total population of CINC projects for 2011.

**Table 19: Comparison of the Final Sample with the Population for the CINC Program**

| Description | Number of Projects | Evaluated Gross Energy Savings at the Generator (GWh/yr) |
|-------------|--------------------|----------------------------------------------------------|
| Population  | 9                  | 2.803                                                    |
| Sample      | 2                  | 0.550                                                    |

The Evaluator also considered using the chosen participation paths (NCCP or NCWB) as a criterion for on-site visit selection. However, only one of the 2011 projects had been undertaken under the NCWB (Project No. 3 of Table 18) at the time of identifying the sites to be visited and it appeared that this project was the least likely to be completed by the end of 2011. This project was thus removed from the sample as it did not comply with the first sampling criterion (project status).

### **5.1.3 On-Site Visit Protocols – C&IC and CINC Programs**

A tailored on-site visit protocol was developed for each C&IC program, in accordance with its respective program specifics and the impact evaluation methodology. These protocols list the key information to be gathered on site. For both programs, the on-site visits involved short interviews with the technical staff (for collecting information on operation schedules) as well as a walk-through audit of the installed equipment.

The next two sub-sections outline information on each protocol along with additional details regarding how the on-site visits were carried out. For reference purposes, the on-site visit protocols that were used for C&IC and CINC programs are attached in Appendix VIII.

#### **On-Site Visit Protocols – C&IC Program**

The protocol followed by the Evaluator for conducting on-site visits of C&IC projects was divided into two documents. The first one was a two-page document showing the project's general information, such as contact details and the amount of savings to be achieved as per different sources (M&V report, ENSC tracking sheet or PDA). In addition, this document defined the facility operation schedules, which included daily time of use (8 a.m. to 5 p.m.) and the number of operating hours per day.

During the site visits, the Evaluator also used copies of the M&V reporting files that ENSC had provided. These files were used to validate technical information, such as the number and type of installed pieces of equipment (e.g. lighting fixtures) along with their respective efficiency. As each C&IC project is different, the Evaluator assumed that using ENSC files would be more time-effective than developing several unique on-site visit protocols. For each on-site visit, the auditors hence brought a copy of the ENSC M&V reporting file and used it on site to validate and adjust (if required) the information it contained.

Finally, the Evaluator developed an information collection form specifically for building lighting retrofit projects. Considering that only four out of the 23 sample projects did not involve building lighting retrofits, it was decided to provide on-site visit auditors with this additional form.

#### **On-Site Visit Protocols – CINC Program**

For the on-site visits to be conducted to CINC program participants, the Evaluator developed a tailored questionnaire based on Core Performance Guide (CPG) criteria with which program participants had complied, namely the seven design process strategies and the 14 CPG requirements. In addition to the six-page questionnaire provided to auditors, seven pages of minimum requirement tables (taken from the CPG) were attached for reference purposes. This questionnaire and its appendices were the main documents that the auditor consulted when conducting the on-site visits.



It is worth noting that the auditor also preliminarily assessed new construction compliance prior to each on-site visit, using the technical documents collected by ENSC. Such technical documents included window specification sheets, various building arrangement drawings (for ventilation, lighting, heating and cooling systems, etc.) and equipment pictures. This preliminary assessment helped hasten the pace of site visits. It also gave the opportunity to validate the information gathered by ENSC and to monitor the modifications, if any, that had occurred since ENSC's previous visit.

As previously mentioned, the CINC projects that were sampled for on-site visits had all been carried out in line with CPG requirements. There was therefore no need for developing an on-site protocol for projects other than those using the CPG requirements.

#### **5.1.4 In-Depth Interviews**

The Evaluator conducted five in-depth interviews with C&IC and CINC program participants (four interviews with C&IC program participants and another with one CINC program participant). The five program participants that the Evaluator met for in-depth interviews were selected on a random basis.

The in-depth interview outcomes were used to conduct a more in-depth evaluation of internal spillover, in contrast with what had previously been done through the telephone survey. Moreover, the interviews were used as an opportunity to obtain a better insight on participant experience and satisfaction with the C&IC and CINC programs, as well as to determine potential suggestions for improving the programs in the future.

The in-depth interview protocol used by the Evaluator is presented in Appendix VI.

## **5.2 GROSS SAVINGS**

The gross savings estimation was computed based on the information available in the program tracking sheet as well as based on the data collected during on-site visits and the savings review. The Evaluator conducted different gross savings analyses that varied in accordance with project specificities, such as the program component in which the customer participated (C&IC or CINC), or the type of energy efficiency measures implemented through the project.

The Evaluator conducted the 25 on-site visits with the aim of calculating the actual savings from the measures implemented at each site. These on-site visits were an opportunity to verify the installation of equipment as well as the context in which the M&V activities had been conducted. The Evaluator collected the required information to estimate equipment operation hours as well as to assess the potential interactive effects on space heating and cooling. After reviewing the savings for each project, the Evaluator developed an adjustment ratio for three types of projects by comparing the savings obtained through on-site visits and the expected savings from the tracking sheet. This ratio was then applied to the savings presented in the tracking sheet to calculate the final gross savings of the program.

### **5.2.1 C&IC – Building Lighting Retrofits**

Lighting retrofits are the energy efficiency measure that generated the bulk of the 2011 energy and demand savings. In fact, 17 out of the 23 C&IC sample projects involved building lighting retrofits only, and four of the six other projects included lighting retrofits as part of their global energy savings approach. Projects that involved building lighting retrofits only accounted for almost 70 percent of the overall projected savings of the C&IC population for the year 2011.

In accordance with the large proportion of building lighting retrofit projects in the 2011 sample, the Evaluator developed a detailed on-site visit methodology aimed at verifying the key factors that impact the gross savings estimate of each project. These factors are listed below in bold, in order of priority.

#### **Unitary Wattage**

The unitary wattage of retrofitted lamps was the first factor considered by the Evaluator. For most lighting retrofit projects, ENSC had already developed a project impact calculation spreadsheet. This file lists all old fixtures to be replaced along with their new high-efficiency equivalent. The file also describes each fixture type (old and new). This information was validated on site by the Evaluator who also ensured that the unitary wattages concurred with standard values (taken from the Office for Energy Efficiency of Natural Resources Canada).

The ballast may also have a relevant impact on the power load of a light fixture (due to the ballast factor). Accordingly, the Evaluator collected additional information on new and old ballasts (when feasible, the Evaluator took note of the nameplate of spare ballasts) during on-site visits. When not written on the nameplate, the ballast factor could be found on the Internet through the manufacturer website.

#### **Installation Rate**

When possible, the Evaluator conducted a census of all new lighting fixtures. In the event that the facility was too large and the number of fixtures was too high, the Evaluator inspected a sample of fixtures that was assumed to be representative of the population. For instance, in a multi-level office building, a census was conducted on a representative level and then all the other similar levels were assumed to have the same number of fixtures installed<sup>8</sup>. In addition, the Evaluator prioritized the inspection of lighting groups that were expected to generate more relative energy savings than other lighting systems within the facility.

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<sup>8</sup> When such a census was performed, the Evaluator previously confirmed with the participant that all the levels were similar and had not been configured too differently under the tenant leases.

Moreover, when the Evaluator noted significant discrepancies between the ENSC M&V report data and the actual fixture count, the Evaluator audited additional areas of the facility with the hope that a more extensive lighting fixture count would provide a more precise estimate of the actual gross savings of the project. In comparison, additional fixture inspections were not required when the Evaluator found no (or very few) discrepancies between its fixture count and ENSC's.

## **Hours of Operation**

To evaluate the hours of operation, the Evaluator first looked at the operating schedules of old and new lighting equipment that program participants had provided to ENSC. The Evaluator then confirmed these figures with the customer during the on-site visit. When ENSC had adjusted the operating schedules through the use of metering data, the Evaluator also discussed the adjusted data with the program participant in order to confirm whether it was accurate.

Occupancy sensors and photocells were also installed in combination with lighting measures for a number of sample projects. For such measures, the energy impact was quantified as a reduction in operating hours, based on the discussion between the Evaluator and the customer during the on-site visit.

## **Interactive Effects**

In its energy and demand savings calculations, ENSC also took into account the potential effects of energy efficiency measures on electric space heating and/or electric space cooling systems. When applicable, the Evaluator therefore confirmed with the program participant which heating and/or cooling system served the target areas of the facility. When feasible, the Evaluator also collected the nameplate information of the installed electric space heating and/or cooling systems in order to confirm their efficiency and nominal capacity.

Furthermore, the interactive effects were adjusted when there were any special circumstances, for instance, related to the space condition set points (dry bulb temperature and relative humidity) to be maintained or related to the annual operation schedules.

## **Diversity Factor**

During the on-site visits, the Evaluator discussed the annual operating schedules of the old and new lighting systems. This assessment helped Econoler estimate the diversity factor to be used for the calculation of coincident peak demand savings. In Nova Scotia, the peak demand period is between 5 p.m. and 7 p.m. on a non-holiday weekday in December, January or February.

### **5.2.2 C&IC – Traffic and Street Lighting**

The 2011 sample included two municipal projects, which involved the replacement of traffic lights and roadway luminaires respectively. These two projects were partly completed and claimed in 2010, and the 2011 component was in fact the termination of project implementation. The methodology employed for project impact verification and on-site visits was therefore similar to that used in 2010.

For these two street lighting projects, the on-site visits included verifying that the correct number of new LED fixtures had been installed at a sample of intersections and that those fixtures worked properly. The intersection lights and roadway luminaires to be audited were randomly chosen. The Evaluator inspected roughly 10 percent of traffic lights and roadway luminaires whose energy and demand savings were supposed to be credited in 2011. Moreover, the Evaluator visited the municipal traffic office to collect additional information on a sample of new and old lighting fixtures (including the lamp and the ballast, if any). Such technical specifications were found on the nameplates of spare lighting fixtures.

The hours of operation were estimated based on ENSC's calculation spreadsheet data, which were then confirmed following discussions between the Evaluator and the city's technical staff. There is no interactive effect to take into account for such outdoor lighting retrofit measures. Moreover, as traffic and street lighting systems are steadily in operation year round, their electricity demand (in kW) is constant. The Evaluator thus set the diversity factor to 100 percent.

### **5.2.3 C&IC – Motors and Drives**

There was only one project of the 2011 sample that involved the installation of variable-speed drives (VSDs) and the replacement of old motors with new high-efficiency motors. More precisely, this project included the installation of eight VSDs on various fans along with the retrofitting of 24 kiln and boiler fan motors. In terms of energy savings (as per the PDA), the VSD installation is the key component of the project since it was expected to generate 91 percent of total project savings, while the motor retrofit was supposed to realize 7 percent of energy savings. The remaining energy savings came from the replacement of several lighting fixtures (2 percent of total savings). This last measure was validated using the methodology outlined in Section 5.2.1.

The M&V of this project was conducted by a consultant and ENSC validated that the equipment had been installed appropriately through an on-site audit. For the project impact evaluation, the Evaluator started with the verification of the M&V report from the consultant. The Evaluator believes that the M&V approach used by the engineering consultant is questionable. Since energy savings to be realized through the installation of VSDs are usually due to the variations of motor loads, the proper M&V approach for evaluating VSD installation impacts is generally power monitoring over a minimum period (2 weeks). IPMVP Options B or C would therefore be appropriate. However, the consultant only made spot measurements with a power clamp meter to evaluate energy savings from VSD installation

and motor retrofit. This approach corresponds to IPMVP Option A and is not accurate for the assessment of such energy efficiency measures.

Upon the completion of the M&V report review, the Evaluator planned and then conducted the on-site visit. During this visit, the Evaluator verified the installation of all VSDs and motors. The Evaluator also took this opportunity to collect the nameplate data of these pieces of equipment, including their make, model, nominal efficiency, capacity or output power (horsepower for the motor), etc. The Evaluator also asked whether the old motor efficiencies written in the project tracking sheet seemed reasonable (since there were no old motors on site). Furthermore, the motor load variations and operation schedules were discussed with the program participants. Finally, the Evaluator reviewed with the program participants the assumptions and calculations made in the consultant's M&V report.

The interactive effects on space heating and cooling systems as well as the diversity factors were finally assessed on site with the same approach as that used for the lighting retrofit project (Section 5.2.1), i.e., data collection of space heating and cooling system specifications and discussion with program participants on operating schedules of the VSD-driven fan motors and other new motors. As a result, Econoler noted that the rooms where the new equipment (motors and VSDs) had been installed were neither heated nor cooled. Econoler thus considered no space heating or cooling effect when calculating the savings. Regarding the peak demand savings calculations, the Evaluator adopted a conservative approach and reduced the diversity factor related to the calculations of VSD demand savings. In fact, such devices did not typically generate significant demand savings and Econoler deemed that the methodology used in the M&V report was not conservative.

#### **5.2.4 C&IC – Refrigeration**

There was only one refrigeration project in the 2011 sample, and this project was characterized in ENSC's tracking sheet as an HVAC project. However, this project also involved the replacement of four thermostatic expansion valves with four electronic expansion valves of the same capacity. These four valves were installed on three chillers (one of the chillers had two expansion valves installed). During the on-site visit interview, the technical resource responsible for the chillers confirmed that these three chillers were not used for purposes (such as space cooling) other than the manufacturing process. This project was therefore considered to be a process refrigeration project.

For project impact evaluation, Econoler first collected the information for the feasibility study. Then, the Evaluator confirmed on site the nameplate technical specifications (capacity and efficiency) of the chillers. Even though the nameplate efficiency gives a good estimate of the chiller efficiency for a set of previously defined conditions (evaporator and condenser temperatures, etc.), the Evaluator had to rely on manufacturer testing to estimate the chiller efficiency at various outside temperatures. In addition, the Evaluator estimated the annual variations of chiller loading based on the calculations of the consultants, cross-checked with the discussions between the Evaluator and the participant.

During the on-site visit, the Evaluator also verified that all of the four electronic expansion valves were installed properly along with the valve controllers and the required sensors on refrigerant piping. Moreover, the Evaluator defined the chiller operation schedules with the customer, which helped estimate the operation hours as well as the diversity factors to be used for energy savings calculations.

Finally, the Evaluator established that this measure has no significant cross effect on the heating and cooling loads. On one hand, there is no space cooling system installed in the process area where the three chillers are located. On the other hand, the customer confirmed that the annual space heating requirements of the manufacturing area are almost zero since the packaging machines are energy-intensive equipment that generate a great deal of heat. For these reasons, the Evaluator determined there was no need for further assessment of potential side-effects on space heating or cooling needs.

### **5.2.5 C&IC – UPS Upgrade**

In the 2011 sample, there was a retrofit project that aimed to replace two inefficient and oversized uninterruptible power supply (UPS) systems. These two identical UPS systems provide backup power to critical areas of the facility. At the time of writing this report, ENSC had only verified on site that the new equipment had been installed and that it was working properly. Then, the energy and demand savings estimated in the feasibility study were assumed to be fully realized. The reason why ENSC did not conduct more in-depth M&V for this project was that it did not at the time have the appropriate measurement tools on hand, i.e., power data loggers. However, ENSC committed to conducting more sound measurement activities for this project by the end of 2011 or in 2012.

For this project, the Evaluator had limited M&V information to assess the actual project impacts. Therefore, the Evaluator reviewed the feasibility study and the spot measurements made by the consultant before and after project implementation. During the on-site visit, the Evaluator also validated that the two UPS systems had been correctly installed and that the nameplate information concurred with the technical specifications of the proposed equipment, in accordance with the feasibility study. Then, the Evaluator discussed the operation hours of the supplied units as well as the potential daily fluctuations (electricity demand during the day and at night because of lighting). This information helped estimate energy consumption using the spot measurement data.

The information collected in discussions with the client was also used for evaluating the diversity factor. Considering that all critical units supplied by the UPS operate continuously year-round, it was preliminarily assumed that the diversity factor should be high (almost 100 percent). During the on-site interviews, the Evaluator also validated with the technical staff that there were no significant reductions in electricity demand from those critical units during annual peak periods in Nova Scotia.

Regarding the interactive effects on heating and cooling systems, the on-site visit showed that the UPS systems are located in mechanical rooms where the temperature control scheme allows wide margins of air temperatures. The Evaluator thus estimated that the interactive effects of the energy

efficiency measure would be negligible and decided not to take them into consideration in the impact calculation.

#### **5.2.6 CINC – New Construction Core Performance Path**

The 2011 sample included two new construction buildings. These two projects were carried out under the NCCP path.

The methodology for assessing the impacts of these two sample CINC projects was separated into three steps. At first, the Evaluator remotely collected information and documentation from ENSC in order to confirm that the new building was in compliance with a number of CPG requirements. The Evaluator was therefore able to confirm a preliminary list of criteria with which the CINC project was compliant. Through this preliminary assessment, the Evaluator also outlined a short list of key queries to be confirmed on site with the program participant.

The second step was the on-site visits of the sample projects. During the on-site visits, the Evaluator used the CINC site visit protocol to conduct the interview with the customer. The criteria of the protocol were discussed with the customer and, when possible, the Evaluator also verified the technical specifications of the building equipment. For instance, the Evaluator verified the compliance of HVAC equipment and water heating systems when such equipment was easily accessible. In addition, the Evaluator counted the installed lighting fixtures and verified that the lamp type was the same as that identified on the electrical lighting plans of the building.

On site, the Evaluator also confirmed with the customer the validity of the documents provided by ENSC. Furthermore, the Evaluator asked if there were new versions of such documents which could show additional information. Then, at the end of the on-site visits, the customer and the Evaluator established a list of documents to be sent to the Evaluator in the following weeks.

The third step of the CINC program impact assessment involved analyzing all the received documents and evaluating the actual compliance of the projects with CPG requirements. The Evaluator also collected any new documentation from either ENSC or sample program participants.

For calculating the verified project impacts, the Evaluator planned to adjust the savings per project based on the building's level of compliance with the CPG. Nonetheless, the two on-site visits revealed that the participants had a very low understanding of how to demonstrate compliance with the CPG. At the time of conducting the two on-site visits, neither of the two participants had already proven that the new building was built to the CPG. Most of the required technical documentation was not available (neither on site nor from ENSC). While a number of CPG requirements were verified visually on site (equipment efficiency and operation, lighting power density, domestic hot water system efficiency, etc.), the Evaluator was not able to validate many relevant components of the CPG, such as the building insulation levels, air barrier performance, full compliance with the ASHRAE 90.1-2004 or the MNECB, etc.

The Evaluator deemed that trying to adjust the tracked savings would lead to inaccurate results, considering the high number of uncertainties revealed through the on-site visits. For the year 2011, Econoler therefore elected to take the energy savings calculated by ENSC without adjustment. Econoler also developed several recommendations for improving next year's program impact evaluation.

### **5.2.7 Adjusted Gross Savings**

The 2011 gross energy and demand savings detailed in the ENSC tracking sheets were revised to include the adjustments calculated by the Evaluator through the comparison of the sample project savings and what was presented in the tracking sheet. To improve the adjustment precision, it was decided to divide the savings adjustment calculation into three categories depending on the measure types:

- > Adjustments to "Lighting Retrofit Only" projects: Due to its predominance in the 2011 population of C&IC projects<sup>9</sup>, the "Lighting Retrofit Only" project type has its own adjustment factors for the energy and demand savings. These factors were calculated using the evaluation of the 17 on-site visits to "Lighting Retrofit Only" program participants.
- > Adjustments to C&IC projects other than "Lighting Retrofit Only": All C&IC projects that were not classified as "Lighting Retrofit Only" projects were adjusted using the same factors as for energy and peak demand savings. These factors were calculated using the average adjustments established upon completion of the six remaining on-site visits of C&IC projects. The average adjustment factors were calculated regardless of the respective size of each visited project.
- > Adjustments to CINC projects: As mentioned in Section 5.2.6, the Evaluator decided to keep the energy savings tracked by ENSC without making any adjustment. Econoler elected to use this approach because many assumptions in regard to the participants' compliance with the CPG were difficult to verify correctly through the on-site visits. Moreover, ENSC did not calculate peak demand savings for the CINC program in 2011. In fact, the demand savings for the CINC projects completed under the NCWB path were not available at the end of 2011. Econoler was therefore unable to account for reliable demand savings for these projects. With regard to the NCCP projects, Econoler elected not to add demand savings for the following reasons:
  - The demand savings values provided by ABI came from building simulations that were not verifiable. These figures were different for each CPG measure, and varied depending on the HVAC systems installed as well as on regional considerations (climate). It was

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<sup>9</sup> As per Appendix IX of this report, the forecast savings of "Lighting Retrofit Only" projects accounted, at the time of making the project sampling, for almost 70 percent of total energy savings through the C&IC program for 2011.



hence complicated to reliably estimate demand savings values for the participants who complied with the CPG.

- The demand savings values calculated by ABI did not take into account any appropriate diversity factors pertaining to the electricity demand profile in Nova Scotia. The diversity factors to be used would likely be different for each measure included in the CPG.
- As mentioned before, the two on-site visits did not allow confirming the compliance level of the participants with the CPG. It was thus not possible to adjust potential demand savings as a function of the level of compliance of visited participants.

It is worth noting that all of the above adjustment factors already take into account the side effects on space heating and cooling systems as well as the diversity factor. There is no need for additional calculations with regard to those two aspects of project impact calculations.

The next table shows the adjustment factors used by the Evaluator for the gross energy and demand savings calculations.

**Table 20: Adjustment Factors for Gross Energy and Demand Savings Calculations**

| Project Type                                          | Adjustment Factors   |                           |
|-------------------------------------------------------|----------------------|---------------------------|
|                                                       | Gross Energy Savings | Gross Peak Demand Savings |
| "Lighting Retrofit Only" C&IC Projects                | -0.5%                | 12%                       |
| All C&IC Projects other than "Lighting Retrofit Only" | -5%                  | -9%                       |
| CINC Projects (NCCP and NCWB paths)                   | 0%                   | N/A                       |

The details of the energy and peak demand savings calculated for the three project categories above are presented in the next table. More precisely, this table outlines the savings at the meter as well as at the generator. Savings at the generator level were calculated using the line loss factor of each participant, which takes into account transmission and distribution losses on the grid. The line loss factor values used were provided by Nova Scotia Power. For reference purposes, the weighted average line loss factors of each project category are presented in Table 21.

Taking everything into account, the 2011 overall gross energy savings for the C&IC and CINC programs are respectively estimated at 30.534 GWh and 2.631 GWh at the meter, and at 32.606 GWh and 2.803 GWh at the generator. For the C&IC program, the 2011 total gross peak demand savings are respectively estimated at 3.790 MW at the meter and 4.047 MW at the generator. On the other hand, no demand savings were calculated in 2011 through the CINC program.

**Table 21: Evaluation Results – Revised Savings in Tracking Sheet**

| Project Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | “Lighting Retrofit Only” C&IC Projects | All C&IC Projects other than “Lighting Retrofit Only” | Total for all C&IC Projects | CINC Projects (NCCP and NCWB paths) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------------|
| Number of Projects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 92                                     | 67                                                    | 159                         | 9                                   |
| <b>Program Tracking Sheets</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                                       |                             |                                     |
| Total Tracked Energy Savings – at the Meter (GWh) ***                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 18.744                                 | 12.509                                                | 31.253                      | 2.631                               |
| Total Tracked Demand Savings – at the Meter (MW) ***                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2.021                                  | 1.677                                                 | 3.698                       | 0                                   |
| <b>Evaluated Energy Savings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                        |                                                       |                             |                                     |
| Adjustment for Energy Savings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -0.5%                                  | -5%                                                   | N/A                         | 0%                                  |
| <b>Total Gross Energy Savings – at the Meter (GWh)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>18.650</b>                          | <b>11.884</b>                                         | <b>30.534</b>               | <b>2.631</b>                        |
| Average Line Loss Factor*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1.067                                  | 1.069                                                 | 1.068                       | 1.065                               |
| <b>Total Gross Energy Savings – at the Generator (GWh)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>19.901</b>                          | <b>12.705</b>                                         | <b>32.606</b>               | <b>2.803</b>                        |
| <b>Evaluated Demand Savings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                        |                                                       |                             |                                     |
| Adjustment on Demand Savings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12%                                    | -9%                                                   | N/A                         | N/A                                 |
| <b>Total Gross Peak Demand Savings – at the Meter (MW)**</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>2.263</b>                           | <b>1.526</b>                                          | <b>3.790</b>                | <b>0</b>                            |
| Average Line Loss Factor*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1.067                                  | 1.069                                                 | 1.068                       | N/A                                 |
| <b>Total Gross Peak Demand Savings – at the Generator (MW)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>2.416</b>                           | <b>1.631</b>                                          | <b>4.047</b>                | <b>0</b>                            |
| <b>Notes:</b><br>* The line loss factors shown in this table are weighted averages calculated using the unitary line loss factor of each participant pertaining to each project category, on the basis of the gross savings (energy or demand) of each participant.<br>** The adjustment factors used on tracked demand savings already takes into account the weighted average diversity factor of each project category.<br>*** The program tracking savings values (energy and demand) already included the interactive effects of energy efficiency measures on existing electrical heating or cooling systems. Accordingly, the adjustment factors calculated by Econoler also took into account any potential interactive effects on space heating and cooling systems. |                                        |                                                       |                             |                                     |

## Recommendations for Future C&IC Project Impact Calculations

Even though the methodology used to calculate the gross savings under the C&IC program is efficient, a number of adjustments could be made in the future to improve it. The Evaluator recommends that ENSC:

- > **Clearly define the M&V requirements before signing the PDA:** The Evaluator noted that most of the projects do not have a dedicated M&V plan even though M&V was considered as complete and approved. The Evaluator recommends that all projects have an M&V plan outlined in the early stages of the project process. If possible, the M&V plans should be compliant with IPMVP Chapter 5. At the least, such plans should define the IPMVP option chosen for M&V (A, B or C) and clearly state what information has to be collected and

measured (if any) before and after project implementation. The Evaluator recommends developing the M&V plan before signing the PDA. The PDA may even enclose a preliminary version of the project's M&V plan. In 2011, ENSC started developing a set of M&V plan templates (especially for simple lighting retrofit projects) which are compliant with the IPMVP. These templates should significantly help program participants develop their own M&V plan and it is a first step toward standardizing the M&V activities performed under the C&IC program.

- > **Envisage performing third-party M&V for C&IC projects that are already carrying out M&V:** ENSC should consider performing third-party M&V on projects where the implementation firm has already planned to conduct M&V under its project scope of work. Such implementation firms may perform M&V that is not compliant with the IPMVP or that includes measures which are not eligible for the C&IC program but are not simple to extract from the M&V results. In addition, giving the sole responsibility of M&V to the firm that also implements the project may be risky. For instance, the M&V of the largest project of the 2011 sample in terms of savings (13 percent of the sample's total energy savings) was conducted by the implementation firm. Any errors in their M&V could therefore have relevant effects on the total program impacts. To reduce this risk, the Evaluator recommends engaging third-party M&V for such projects. A minimum threshold of energy savings (500 MWh/year) could also be defined to differentiate projects that would automatically require third-party M&V from those for which it would be optional. The Evaluator believes that third-party M&V could be done either by ENSC or by an independent consultant.
  
- > **Build the capacity of ENSC on M&V and IPMVP requirements:** As per the program manual, all C&IC projects must have an M&V plan compliant with the IPMVP (Section 5.7 of the program manual). This would also mean that all projects must involve measurement, at a minimum on the key parameter (IPMVP Option A). However, the Evaluator did not find the M&V plans for most of the 23 evaluated projects. For the projects which had an M&V report made by a third party, the Evaluator found a number of discrepancies in the way the measurement was done that were not compliant with the IPMVP. For instance, spot measurements were performed for projects that should have been evaluated using run-time measurement over a minimum period of time (installation of VSDs or high efficiency motors, improvement of refrigeration equipment, etc.). With such a methodology, the third party has to include many assumptions in its savings calculations, which increases the inaccuracies of the M&V results. Furthermore, ENSC measured a number of lighting retrofit projects. Nevertheless, the parameter that ENSC chose to measure for many of these projects was the operation hours, which is not the "key parameter" as per the IPMVP.<sup>10</sup> For the lighting retrofit

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<sup>10</sup> In the IPMVP, the "key parameter" is the parameter whose performance defines the energy savings due to the implementation of the energy conservation measure.

projects, the parameter that should have been measured was the pre- and post-retrofit wattage of the lighting fixtures. With this in mind, the Evaluator encourages ENSC to organize trainings on M&V and the IPMVP for C&IC program staff.

- > **Record the diversity factors used for peak demand savings calculations:** When analyzing the C&IC savings per project, Econoler realized that the diversity factors used by the PM for computing peak demand savings were very conservative. For a number of projects, the diversity factors assumed by ENSC were in fact not representative of reality. For instance, one of the 2011 projects involved lighting retrofitting in a large supermarket. For the calculation of the peak demand savings of the new lights installed in the main area, ENSC used a diversity factor of 70 percent, regardless of the fact that the facility was opened 24 hours per day. In such a situation, the diversity factor to be used should be almost 100 percent since the new lighting system will be in full operation during the peak period in Nova Scotia. Therefore, Econoler considers that recording the diversity factor of each project in the program tracking sheet, along with the rationale for the choice of each diversity factor value, would be a good practice and help future evaluations of this program's impacts.

## **Recommendations for Future CINC Project Impact Calculations**

For future years, the Evaluator recommends the following with regard to gross impact calculations of new construction projects under the CINC program:

- > **Conduct a separate complete evaluation for the CINC program:** In 2010, only one new construction project was included in the C&IC program. This project was implemented using a "whole building" approach and its savings accounted for a small percentage of total C&IC program impacts. As mentioned previously, the CINC program included nine projects in 2011 and generated almost 3 GWh per year of gross savings at the generator. The impacts of the CINC program are also expected to increase in the upcoming years. With this in mind, Econoler believes ENSC should conduct a separate complete evaluation for the CINC program in 2012. Moreover, a separate evaluation could help shed light on all the uncertainties in calculating the savings related to CPG compliance (technical documentation, building simulations from ABI, potential demand savings, etc.).
- > **Define different energy savings indices (in kWh/m<sup>2</sup>) depending on various factors:** The use of a general energy savings index for project savings calculations introduces a bias, especially because the small group of program participants is not necessarily representative of the building population in Nova Scotia. Consequently, the Evaluator recommends calculating a set of energy savings indices (in kWh/m<sup>2</sup> or kWh/ft<sup>2</sup>) that would vary depending on factors such as building characteristics (type of HVAC systems), climate zones (there were two climate zones that have been used for building load simulations, namely the Greenwood and Shearwater airports) as well as the building market sector (office, retail and warehouse). Using

such indices should lead to energy savings calculations per project that are closer to actual project savings.

- > **Review the simulation made for the warehouse typical building:** Through the impact evaluation process, ENSC submitted the spreadsheet “1 Measure Level Outputs – All Buildings.xlsx,” which showed the key results from the building simulations performed by the New Buildings Institute through its Advanced Buildings Program. When looking at the simulation results, the Evaluator noted an anomalous result in the warehouse simulations. In fact, the simulations show that applying the CPG would raise the energy consumption of such buildings when compared to a typical warehouse compliant with the Model National Energy Code for Buildings (MNECB) of 1997. The Evaluator estimates that this discrepancy is mainly due to the lighting power density criterion of the CPG<sup>11</sup>, which ranges from 6.34 to 14.79 W/m<sup>2</sup> in the CPG, whereas the MNECB-1997 prescribes a maximum light power density from 3.2 to 10.8 W/m<sup>2</sup>. As Criterion 2.1 of the CPG<sup>12</sup> states that the new building must comply with MNECB-1997 requirements, applying the light power density criterion of the CPG should not increase the new building energy consumption. In addition, the way the cross effects on the building heating systems are calculated should also be verified to ensure that these cross effects are not overestimated, which would explain why the CPG-compliant warehouse building consumes more than the typical MNECB-compliant warehouse building.
- > **Add a limited amount of peak demand savings in project impact calculations:** For 2011, ENSC did not calculate electricity demand savings for the CINC projects. When reviewing the New Buildings Institute’s simulations, the Evaluator noted that demand savings had actually been estimated for each building type. Even though such demand savings are very small per project, they could raise the overall impact of the program with future increases in the number of program participants. ENSC should also consider using an estimated diversity factor for the calculation of the demand savings per project. The diversity factor to be used could be based on the expected operation schedule of the new building. ENSC could also define a set of diversity factors depending on the future building usage.
- > **Consider redefining the CPG baseline taking into account up-to-date construction practices:** The potential energy savings to be realized due to the implementation of the CPG are estimated using a facility built to the 1997 Model National Energy Code for Buildings (MNECB) as the basis for comparison.<sup>13</sup> Even though the MNECB 1997 is not mentioned as the baseline in the Feasibility Study Guide, the Evaluator strongly recommends undertaking a market study that would establish whether the MNECB was surpassed as the standard practice

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<sup>11</sup> CPG, Criterion 2.7: Lighting Power Density, p. 54.

<sup>12</sup> CPG, Criterion 2.1: Energy Code Compliance, p. 43.

<sup>13</sup> On page 11 of the CPG, the text refers to savings from 25 percent to 35 percent over beyond the performance of a building that meets the requirements of the MNECB 1997.

for new constructions, additions or major renovations. If it has been surpassed, the baseline will have to be adjusted accordingly.

- > **Use the PDA savings figures for estimating NCWB project savings:** Under the NCWB approach, the participants are asked to fulfill and sign a PDA with ENSC prior to starting the building construction. This PDA should include a feasibility study, which assesses the potential savings to be generated in the new energy-efficient building. When forecasting NCWB project impacts, it would be a good practice to always use the savings data from the PDA (when available) instead of placeholder savings factors (in kWh/m<sup>2</sup> or kWh/ft<sup>2</sup>). If the M&V is not completed at the end of the year, the PDA savings figures would also be a better estimate of the actual project impacts than any general savings value per area unit.

### 5.3 NET-TO-GROSS RATIO

The NTGR evaluation of the C&IC program impacts is based on a self-report approach which relies on a series of questions designed to measure the influence of the program on participants' decision to purchase eligible energy-efficient products. These questions were included in the participant survey and in five in-depth interviews conducted on site.

This section presents the methodology used to convert the survey and interview responses into an appropriate NTGR for the C&IC program. The NTGR calculation method includes the assessment of two key distortion effects: free-ridership and internal spillover. Once each effect is quantified, the NTGR is calculated based on the equation below.

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ internal spillover})$$

The next section outlines how the two abovementioned distortion effects (free-ridership and internal spillover) have been calculated for the C&IC program. Furthermore, because of the small population of CINC projects and their limited contribution to overall energy and demand savings of the C&I Custom program<sup>14</sup>, the phone survey did not include any CINC program participants. In addition, only one of the five in-depth interviews was conducted with a CINC customer, which cannot be considered a representative sampling. However, this in-depth interview revealed a potential free-rider attitude in the decision of the customer to participate in the program.

Finally, Econoler deemed that the spillover level of the CINC program should be very low, as was the case with the C&IC program (refer to Section 5.3.2 for additional details). Consequently, the NTGR used for the calculation of the net savings realized through the CINC program is the same as that found for the C&IC program.

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<sup>14</sup> For the year 2011, the target energy and demand savings of the CINC component of the C&I Custom program accounts for only 10 percent of total forecast savings.

### **5.3.1 Free-Ridership**

In the program, free-ridership can occur when participants declare they would still have implemented the energy efficiency measures in the absence of the program. In 2011, ENSC enhanced the screening of participants for free-ridership before approving their application. The answers provided by the participant during this process were taken into account in conjunction with the telephone survey answers. The telephone survey included eight free-ridership questions divided into four groups that attempted to measure:

- > the probability that the customer would have implemented the same energy efficiency measures in the absence of the program and, if yes, the likelihood that the program encouraged the customer to implement the measures earlier than they would have otherwise;
- > the probability that the participant would have paid the full cost of the project in the absence of the program incentives and/or on-bill financing;
- > the probability that the customer would have installed a standard efficiency piece of equipment instead of the energy-efficient equivalent model;
- > the factors, other than the program, that might have affected the customer's decision; and
- > the temporal sequence of the program and the customer's decision.

Each group of questions are transposed into a level of program attribution which is used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix X.

When compared to the free-ridership assessments of the previous years, the Evaluator's approach for estimating the program free-ridership level preserved the key elements that were applied from 2008 to 2010. However, the following enhancements were incorporated into this year's free-ridership evaluation methodology:

- > A 0 to 10 scoring system was introduced rather than fixed categories that were assigned weights.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participants' energy efficiency decision making rather than focusing narrowly only on their rating of program importance. This question structure more accurately reflects the complex nature of the real-world decision making and helps ensure that the most relevant non-program influences are considered in the free-ridership assessment in addition to program influences.

Noteworthy is that the Evaluator's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York State, Oregon and Pennsylvania.

Upon the completion of the survey result compilation and comparison with answers given to screening questions asked by ENSC before participation, the free-ridership evaluation approach of 2011 revealed a free-ridership level of 7 percent for the C&IC program. The free-ridership level decreased by 3 percent in 2011 in comparison to the evaluation of 2010 (10%). This difference in the free-ridership level could be due to the enhanced screening process put in place by ENSC. This process was improved with all participants who signed the PDA in 2011. A lower level of free-ridership was observed with these participants than with participants who signed the PDA in 2010 but finalized their project implementation in 2011.

### **5.3.2 Spillover**

Within typical programs, the internal spillover effects are additional energy and demand savings that may have been generated due to program influences, but without any direct financial or technical support from the program (technical assistance, incentives, on-bill financing, etc.). For the C&IC program, internal spillover occurs when participants implement eligible energy efficiency measures after their previous participation in the program and due to its influence, but without additional support of any kind from the program. The next subsection presents in detail the spillover effect assessment undertaken by the Evaluator for 2011.

Similarly, internal spillover effects related to the CINC program could be contemplated if participants were to construct another new energy-efficient building after participating in the program but without the renewal of their participation in that program. Since such a situation is not likely to happen often and since the sole in-depth interview conducted with a CINC program participant did not show any relevant sign of internal spillover, the Evaluator decided to consider CINC program internal spillover as negligible.

### **Evaluation of C&IC Program Spillover**

For the year 2011, the Evaluator assessed internal spillover effects for the C&IC program through a participant telephone survey and four in-depth interviews. During the telephone survey, participants were asked if there were any energy efficiency measures recommended in this feasibility study that they had decided not to implement through the program. If such was the case, the surveyed participants were then asked if they had implemented (or were implementing) any or all of these energy efficiency measures and, if so, to define each energy efficiency measure (to validate program eligibility) as well as the reason(s) they had chosen not to implement the measures during their participation. In the event this was not the case, there were no other questions related to spillover assessment.



With the aim of refining the spillover evaluation, the Evaluator also carried out four in-depth interviews with C&IC program participants in November 2011.<sup>15</sup> Through these interviews, the Evaluator asked questions similar to those included in the telephone survey in addition to seeking more details as to the reason the customer had decided to implement additional measures without participating in the program. This helped verify the level of program influence in the decision making process. Furthermore, the Evaluator did not limit its evaluation to the measures that were detailed in the feasibility study. The Evaluator asked questions on the intentions of the program participant toward implementing future energy efficiency measures with or without the program's financial support.

Past evaluations revealed no internal spillover. This year, a new approach coupling a phone survey with in-depth interviews was used to capture potential internal spillover. Nevertheless, the estimated level of internal spillover remains zero. During the telephone survey, none of the participants declared having implemented additional energy efficiency measures following their participation in the C&IC program. For the 2011 program impact evaluation, Econoler therefore considers the internal spillover level as null.

## 5.4 NET SAVINGS

The net savings for the C&IC and CINC programs were estimated using the NTGRs above. The equation below was used to calculate the respective net savings of both C&I Custom programs.

$$\text{Net savings} = \text{gross evaluation savings} \times \text{net-to-gross ratio}$$

This equation was used for both demand and energy savings. The results obtained are presented in the next table.

**Table 22: 2011 Net Demand and Energy Savings for C&IC and CINC Programs at the Generator**

|                                           | C&IC Program                        |                                         |                                    |                                        | CINC Program                        |                                         |
|-------------------------------------------|-------------------------------------|-----------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|-----------------------------------------|
|                                           | Energy Savings – at the Meter (GWh) | Energy Savings – at the Generator (GWh) | Demand Savings – at the Meter (MW) | Demand Savings – at the Generator (MW) | Energy Savings – at the Meter (GWh) | Energy Savings – at the Generator (GWh) |
| <b>Evaluation Results – Gross Savings</b> | 30.534                              | 32.606                                  | 3.790                              | 4.047                                  | 2.631                               | 2.803                                   |
| NTGR                                      | 0.93                                | 0.93                                    | 0.93                               | 0.93                                   | 0.93                                | 0.93                                    |
| <b>Evaluation Results – Net Savings</b>   | <b>28.397</b>                       | <b>30.323</b>                           | <b>3.524</b>                       | <b>3.764</b>                           | <b>2.447</b>                        | <b>2.607</b>                            |

<sup>15</sup> As previously mentioned, one in-depth interview was also carried out with a CINC program participant. This interview did not reveal significant internal spillover effects for this program.

In the next table, the Evaluator compared the net energy savings values calculated in the previous table with the program tracked net savings for 2011.

**Table 23: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>C&amp;IC and CINC Program<br/>Gross Savings</b> | <b>NTGR</b> | <b>C&amp;IC and CINC Program<br/>Net Savings</b> |
|---------------------------|----------------------------------------------------|-------------|--------------------------------------------------|
| <b>Energy Savings</b>     |                                                    |             |                                                  |
| Tracked Savings from ENSC | 36.184 GWh                                         | 0.90        | 32.565 GWh                                       |
| <b>Evaluation Results</b> | <b>35.409 GWh</b>                                  | <b>0.93</b> | <b>32.930 GWh</b>                                |
| <b>Demand Savings</b>     |                                                    |             |                                                  |
| Tracked Savings from ENSC | 3.949 MW                                           | 0.90        | 3.554 MW                                         |
| <b>Evaluation Results</b> | <b>4.047 MW</b>                                    | <b>0.93</b> | <b>3.764 MW</b>                                  |

As per the last table, the evaluated net energy savings of the C&IC and CINC programs are higher than those tracked by ENSC by approximately 1 percent. This difference is mainly due to the improvement of the free-ridership level, from 10 percent in 2011 to 7 percent for 2011 evaluation. This difference in the free-ridership level is due in part to the enhanced screening process put in place by ENSC. This process was improved with all participants who signed the PDA in 2011.

In regard to the C&IC program impact evaluation, Econoler also made slight adjustments to the calculated gross savings in accordance with the outcomes of the assessment of 23 sample projects. In detail, the energy savings of the sample projects that involved only lighting retrofitting were reduced by 0.5 percent while all other C&IC sample projects had their tracked energy savings reduced by 5 percent.

With respect to the CINC program gross savings, Econoler decided not to make adjustments to the tracked energy savings from ENSC. On the one hand, the high level of missing information as well as the concerns brought up when reviewing the building simulation results made the assessment of NCCP project savings inaccurate. On the other hand, no in-depth evaluation (on-site visit, technical documentation review) was planned for the NCWB projects, which were initially forecast to represent a small percentage of CINC program savings. In reality, the two NCWB projects of 2011 accounted for more than 40 percent of total program energy savings.

For the C&IC program, the evaluated net demand savings are higher than those tracked by ENSC. In addition to the increase of the NTGR from 0.90 in 2010 to 0.93 in 2011, the other main reason for this difference is that Econoler adjusted upward a number of diversity factors used for computing the peak demand savings of sample projects, in accordance with equipment operations and particularities. Econoler considered that the diversity factors used by ENSC were sometimes too conservative, especially for the lighting retrofit projects.

## APPENDIX I – RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated. These recommendations are divided into two categories depending on which program component they target (C&IC or CINC):

### RECOMMENDATIONS PERTAINING TO THE C&IC PROGRAM

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Add more information on M&amp;V aspects:</b> In the M&V section of the program manual (Section 5.7), there should be additional information describing who pays for M&V activities, who selects the Option (A, B or C) of the International Performance Measurement and Verification Protocol (IPMVP) to be used and who accepts it. The fact that all projects are measured should also be mentioned. During the 2011 program evaluation, the PM advised Econoler that a new M&V section was being drafted, with the aim of including it in the 2012 program manual. Econoler therefore recommends including at least the above-mentioned information in this new M&V section.                              |
|                               | <b>2. Explain the “Custom Client Response Process” form in the program manual:</b> The “Custom Client Response Process” form has multiple purposes such as determining project eligibility, establishing the level of incentive, estimating free-ridership levels, etc. This should be explained in the program manual.                                                                                                                                                                                                                                                                                                                                                                                            |
|                               | <b>3. Clarify the use of the terms “preliminary energy audit” and “scoping study”:</b> In the program literature, the terms “preliminary energy audit” and “scoping study” are used alternatively. It may be confusing since an energy audit can be considered either a scoping study or a complete feasibility study. It is recommended to always use the same two terms (scoping study and feasibility study) so as to avoid such confusion among future participants. The program literature should clearly state that the term “scoping study” encompasses typical preliminary energy audits and then stop using the other one. Noteworthy is that this recommendation is also applicable to the ENSC website. |
|                               | <b>4. Provide the parameters used for estimating program objectives:</b> The program objectives are forecast in terms of net savings. This means that they include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the gross savings. These parameters should be documented in the program manual so that the PM and the Evaluator can keep track of the assumptions used to estimate the program targets. After each evaluation, these parameters are adjusted accordingly for estimating the program objectives of the years to come.                                                                                       |

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| <b>Program Manual Content</b> | <p><b>5. Complete the program manual to keep track of changes and standardize the content:</b> The program manual is well written, but the information is not comprehensive enough to serve as “program memory” in case of modifications or staff changes (e.g. program justifications and total savings objectives are missing). Furthermore, the content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Program Tracking Sheet</b> | <p><b>6. Develop a standardized nomenclature to name the electronic files:</b> A nomenclature for naming project documents exist in the program manual but seems not to be systematically applied. In addition, the project name should include more information, such as the project number, the document type (form 2, form 7, etc.) and the revision of the file. Many documents have the same name even though they do not pertain to the same project. This situation may be confusing, especially when the document is downloaded directly from the DSMDS.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                               | <p><b>7. Continue standardizing the entries and fix limitations:</b> To avoid entering the same information in different ways, ENSC should continue integrating a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the likelihood of data entry errors. Below are typical examples where standardized entries and limitations would have been useful.</p> <ul style="list-style-type: none"> <li>– “Project Details” field: Inconsistencies were found in this column, such as “Lighting Retrofit” and “Lighting Retrofit.” Moreover, a number of projects were defined as “Lighting/HVAC” while others were identified as “HVAC/Lighting.” Similarly, the Evaluator found a “Solar” project that was neither classified as a “Solar Hot Air” nor as a “Solar Hot Water” project.</li> <li>– “%Installed” field: When summing the percentage installed of each project for 2010 and 2011, the Evaluator noted that several projects appeared as if they had been more than 100% installed.</li> </ul> |
|                               | <p><b>8. Split the customer name field in two columns:</b> At the time of conducting the tracking sheet evaluation, there was no project description column. There was only a “Customer Name” column which occasionally contained information that was more related to the project type than to customer identification (e.g. “Lighting Retrofit,” “Mechanical Cooling,” etc.). To reduce the likelihood of such errors, the Evaluator recommends creating a “Project Name” column that would contain any relevant description of the project. The PM should then ensure that the “Customer Name” field is fully dedicated to customer identification using standardized names. In other words, only standard customer names should be written in this column. With the new ENSC project numbering, the user cannot easily filter projects per program participant. The addition of this new “Project Name” column along with the standardization of “Customer Name” column entries would help address this issue.</p>                                                      |

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| <b>Program Tracking Sheet</b> | <p><b>9. Add a new field for the savings at the consumer level:</b> At the time this report was written, the field for the 2011 installed energy savings (in kWh) was supposed to sum energy savings at the generator level (i.e., the sum of energy savings at the consumer level and related losses on the grid). In some cases, the Evaluator found that the energy savings entered in the tracking sheet were the same as the ones found in the M&amp;V report, which do not take line losses into consideration. To reduce the risk of such errors, the Evaluator recommends adding a new column in the project tracking sheet to show energy savings at the meter independent from the energy savings at the generator.<sup>16</sup> As the rate code of each C&amp;IC participant is already included in the tracking sheet, an Excel function could automatically calculate the savings at the generator. Furthermore, the existing energy savings field should be clearly identified as being “at the generator level.</p>                                                                                                                                                                                                                                                                                            |
|                               | <p><b>10. Split the demand savings field in two different columns:</b> In the C&amp;IC program tracking sheet, the “installed demand savings” field contains figures that may be either in kW or kVA, depending on the tariff rate of the customer. This situation leads to a major bias when the users want to sum the figures of this column, regardless of each customer’s rate code. The kW and kVA figures will be very similar when the power factor of the measure is almost 1. However, when implementing the measure significantly improves the equipment power factor, the kVA and kW figures may be very different. For instance, the feasibility study of an uninterruptible power supply replacement project estimated the apparent demand savings at 84.5 kVA while the estimated real demand savings were only 8.5 kW (ten times less). Moreover, entry errors are more likely to occur when a field can contain data using different units (kW or kVA). Therefore, the Evaluator recommends splitting this installed demand savings column in two to differentiate the installed demand savings in kW and kVA, respectively. In addition, the demand savings in the kW field should be systematically entered for all projects, whereas data may be entered in the kVA field only when they are available.</p> |

<sup>16</sup> A number of projects involve the use of multiple rate codes. In such cases, ENSC should use a weighted average of the line loss factor of each facility included in the project. A note should also be added to keep track of this calculation. Nonetheless, this situation is not likely to happen often (for 2011, no project involves the use of more than one line loss factor per project).

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| <b>Program Design and Implementation</b> | <p><b>11. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. The Evaluator strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p> <p><b>12. Track the number of energy audits that are not accepted:</b> For program performance purposes, ENSC should track the number and relevant details of the energy audits submitted for review that it decides not to accept under the C&amp;IC program. If there are too many such audits (e.g. more than 10 percent), that may mean that the eligibility criteria are unclear and should be adjusted. This could also indicate potential issues with the consultants who conducted the energy audits.</p> <p><b>13. Standardize the internal screening process:</b> Free-ridership is an important concern for the C&amp;IC program. Through the C&amp;IC project participation process, free-ridership is currently being screened based on the customer's investment criteria. The program manual also presents a list of free-ridership screening questions used by ENSC at the early stage of a project. However, ENSC does not compile systematically the names and answers of program participants who are screened out due to free-ridership in a centralized file. With the aim of making this internal screening process more efficient, Econoler recommends that ENSC develop tailored tracking mechanisms for collecting and recording all answers from potential participants with respect to free-ridership screening questions. ENSC would thereby be able to analyze the answers of participants who are screened out and could make proper adjustments to program process (target marketing activities, make ineligible several measures that are now considered as standard practices). The program tracking sheet could also contain a note (if worthwhile) for participants with a potential for free-ridership.</p> |
| <b>Section of ENSC Website</b>           | <p><b>14. Add more eligible customers in the "Who Is Eligible" section:</b> In the "Who Is Eligible" section, ENSC should add industrial sector companies to the commercial businesses. This section should also mention the large institutional customers as eligible customers since the C&amp;IC program targets hospitals, universities and regional school boards as well.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| <b>Section of ENSC Website</b>    | <b>15. Supplement the ENSC website with information taken from Appendix H of the C&amp;IC program manual:</b> Appendix H of the program manual, intended to <b>facilitate</b> staff training, is a very good initiative in case there are changes of program staff. Some components of this appendix could be used in a frequently asked questions (FAQs) section dedicated to the C&IC program on the ENSC website.                                                                                                                                                                      |
|                                   | <b>16. Change the title of the “Nova Scotia Power On-Bill Financing” section for potential participants that are not directly supplied by NSPI:</b> In the “Nova Scotia Power On-Bill Financing” section, referring only to the NS Power bill could result in clients of independent municipal electric utilities not understanding that they can also benefit from on-bill financing. To avoid confusion, the title of the section could be “Electricity Bill Financing” and additional information could be given for customers served by municipal electric utilities.                 |
| <b>Relationship with Partners</b> | <b>17. Keep working to enhance program awareness:</b> To improve program performance, the verification partner suggested that ENSC keep encouraging clients to participate in the program since the main barrier is the lack of awareness of the program on the part of industrial and commercial clients. This suggests that perhaps the marketing activities should be enhanced even if the verification partner expressed a high level of satisfaction with the marketing and outreach activities.                                                                                     |
| <b>Participant Perspectives</b>   | <b>18. Focus on the financial benefits of the program:</b> ENSC should continue to focus on the financial benefits of the program since savings on energy cost and program incentives are still the main participant motivations.                                                                                                                                                                                                                                                                                                                                                         |
|                                   | <b>19. Continue to use contractors and design professionals to promote the program:</b> Seventy-five percent of respondents reported that someone outside their organization took most of the responsibility for specifying the measures that were implemented through the program. Similar to 2009 and 2010 findings, design professionals (30%) and contractors (30%) are listed as parties most often responsible for specifying the measures implemented. Therefore, contractors and design professionals represent channels that may be effectively utilized to promote the program. |

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| <b>Impact Evaluation</b> | <p><b>20. Clearly define the M&amp;V requirements before signing the PDA:</b> The Evaluator noted that most of the projects do not have a dedicated M&amp;V plan even though M&amp;V was considered as complete and approved. The Evaluator recommends that all projects have an M&amp;V plan outlined in the early stages of the project process. If possible, the M&amp;V plans should be compliant with IPMVP Chapter 5. At the least, such plans should define the IPMVP option chosen for M&amp;V (A, B or C) and clearly state what information has to be collected and measured (if any) before and after project implementation. The Evaluator recommends developing the M&amp;V plan before signing the PDA. The PDA may even enclose a preliminary version of the project's M&amp;V plan. In 2011, ENSC started developing a set of M&amp;V plan templates (especially for simple lighting retrofit projects) which are compliant with the IPMVP. These templates should significantly help program participants develop their own M&amp;V plan and it is a first step toward standardizing the M&amp;V activities performed under the C&amp;IC program and it.</p>                                                                                                                                                            |
|                          | <p><b>21. Envisage performing third-party M&amp;V for C&amp;IC projects that are already carrying out M&amp;V:</b> ENSC should consider performing third-party M&amp;V on projects where the implementation firm has already planned to conduct M&amp;V under its project scope of work. Such implementation firms may perform M&amp;V that is not compliant with the IPMVP or that includes measures which are not eligible for the C&amp;IC program but are not simple to extract from the M&amp;V results. In addition, giving the sole responsibility of M&amp;V to the firm that also implements the project may be risky. For instance, the M&amp;V of the largest project of the 2011 sample in terms of savings (13 percent of the sample's total energy savings) was conducted by the implementation firm. Any errors in their M&amp;V could therefore have relevant effects on the total program impacts. To reduce this risk, the Evaluator recommends engaging third-party M&amp;V for such projects. A minimum threshold of energy savings (500 MWh/year) could also be defined to differentiate projects that would automatically require third-party M&amp;V from those for which it would be optional. The Evaluator believes that third-party M&amp;V could be done either by ENSC or by an independent consultant.</p> |



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| <b>Impact Evaluation</b> | <p><b>22. Build the capacity of ENSC on M&amp;V and IPMVP requirements:</b> As per the program manual, all C&amp;IC projects must have an M&amp;V plan compliant with the IPMVP (Section 5.7 of the program manual). This would also mean that all projects must involve measurement, at a minimum on the key parameter (IPMVP Option A). However, the Evaluator did not find the M&amp;V plans for most of the 23 evaluated projects. For the projects which had an M&amp;V report made by a third party, the Evaluator found a number of discrepancies in the way the measurement was done that were not compliant with the IPMVP. For instance, spot measurements were performed for projects that should have been evaluated using run-time measurement over a minimum period of time (installation of VSDs or high efficiency motors, improvement of refrigeration equipment, etc.). With such a methodology, the third party has to include many assumptions in its savings calculations, which increases the inaccuracies of the M&amp;V results. Furthermore, ENSC measured a number of lighting retrofit projects. Nevertheless, the parameter that ENSC chose to measure for many of these projects was the operation hours, which is not the “key parameter” as per the IPMVP.<sup>17</sup> For the lighting retrofit projects, the parameter that should have been measured was the pre- and post-retrofit wattage of the lighting fixtures. With this in mind, the Evaluator encourages ENSC to organize trainings on M&amp;V and the IPMVP for C&amp;IC program staff.</p> |
|                          | <p><b>23. Record the diversity factors used for peak demand savings calculations:</b> When analyzing the C&amp;IC savings per project, Econoler realized that the diversity factors used by the PM for computing peak demand savings were very conservative. For a number of projects, the diversity factors assumed by ENSC were in fact not representative of reality. For instance, one of the 2011 projects involved lighting retrofitting in a large supermarket. For the calculation of the peak demand savings of the new lights installed in the main area, ENSC used a diversity factor of 70 percent, regardless of the fact that the facility was opened 24 hours per day. In such a situation, the diversity factor to be used should be almost 100 percent since the new lighting system will be in full operation during the peak period in Nova Scotia. Therefore, Econoler considers that recording the diversity factor of each project in the program tracking sheet, along with the rationale for the choice of each diversity factor value, would be a good practice and help future evaluations of this program’s impacts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |

<sup>17</sup> In the IPMVP, the “key parameter” is the parameter whose performance defines the energy savings due to the implementation of the energy conservation measure.

## RECOMMENDATIONS PERTAINING TO THE CINC PROGRAM

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <b>Program Manual Content</b> | <b>1. Define the expression “artificially-low baseline”:</b> In Section 3.2 of the Feasibility Guide (Appendix B), the expression “artificially-low baseline” is written in a yellow textbox. It would be preferable to define this expression and give an example of what it refers to.                                                                                                                                                                                                                                                                                                                                        |
|                               | <b>2. Develop a short standard form to include in the Executive Summary of the feasibility study of NCWB projects:</b> In regards to the Executive Summary of the feasibility study (point 6.2 of Appendix B), it is recommended that ENSC have a one-page compulsory standard form for all NCWB projects that would outline the key information of the feasibility study. Similar to the one required in the C&IC program, this document could give a quick overview of each project and be very useful for data mining purposes.                                                                                              |
|                               | <b>3. Provide the parameters used for estimating the program objectives:</b> The program objectives are forecast in terms of net savings. This means that they include any distortion effects, whether they are positive or negative. They also include interactive effects, when not taken into account in the gross savings. These parameters should be documented in the program manual so that the PM and the Evaluator can keep track of the assumptions used to estimate the program targets. After each evaluation, these parameters are adjusted accordingly for estimating the program objectives of the years to come |
|                               | <b>4. Standardize the use of terms in Section 4.3.3:</b> In Section 4.3.3 of the program manual (Feasibility Study Incentive – Whole Building & Custom Paths), the Evaluator recommends always using the same terminology to designate a product or activity. In this case, the program manual uses alternatively the terms energy audit and feasibility study. Using the same terms for the same activities all along the document should reduce confusion.                                                                                                                                                                    |
|                               | <b>5. Provide program participants with a printable version of the CPG:</b> If possible, the Evaluator recommends providing the program participants with a printable copy of Appendix H of the program manual, i.e., the CPG. Since this guide is a key reference tool for participants who follow the NCCP, it would be useful for them to have paper copies of the PDF document.                                                                                                                                                                                                                                             |

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| <b>Program Tracking Sheet</b> | <p><b>6. Create automatic formulas for calculating data that are dependent on data of other fields:</b> In tracking systems, it is a good practice to create automatic links in fields where information is dependent on the information written in another field. This practice reduces the number of entries to be keyed in by the users and thus decreases the likelihood of data entry errors. In the CINC tracking database, one column calculates the financial incentives of each project, depending on the program path taken (NCCP or NCWB). Considering that another column already states which CINC program path is taken to conduct the project, the Evaluator recommends creating a function in the “Potential Incentives” column that would automatically calculate the potential incentive for each project based on the chosen program path.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                               | <p><b>7. Standardize the entries and fix limitations:</b> To avoid entering the same information in different ways, ENSC should integrate a drop-down list of answers when possible. This will facilitate the treatment of data for evaluation purposes and reduce the likelihood of data entry errors. Here are typical examples where standardized entries would have been useful:</p> <ul style="list-style-type: none"> <li>– “Path” column: There are two choices that could be entered here, i.e., EM (“Energy Modeling”) for the NCWB path or CP (“Core Performance”) for the NCCP path. Here, the use of a drop-down list would help avoid typo errors. Incidentally, ENSC should also consider using the same acronyms for defining the project path as those used in the program manuals, i.e., NCCP and NCWB instead of CP and EM.</li> <li>– “Status” column: As per its name, this field aims to identify the project progress status. Nevertheless, the project status options used here vary. The Evaluator recommends defining a short list (four to seven) of typical project status options in accordance with the program process charts to be found in the program manual. This would ease the follow-up of each project and quickly assess the overall program status. Then, ENSC could add another column to add any additional relevant comments on the project status.</li> <li>– “Finish Month” column: This column is another example of a field in which the information could be easily standardized to alleviate data entry errors.</li> </ul> |
|                               | <p><b>8. Add a peak demand savings field:</b> The CINC tracking sheet shows the amount of energy savings to be achieved for each project. Nevertheless, there is no column to track the peak demand savings. Even though the participants cannot achieve peak demand savings through the NCCP path using ENSC’s impact calculation methodology, the participants using the NCWB path can still generate peak demand savings as they develop their project under a custom approach. Consequently, the Evaluator recommends adding a column in the tracking sheet to follow these peak demand savings.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| <b>Program Tracking Sheet</b>            | <p><b>9. Track the market type of each customer:</b> The PM should consider adding the market sector of each customer (e.g. “Commercial,” “Industrial,” “Institutional,” etc.) for tracking purposes. This additional information could also help quickly identify which market sectors contribute the most to the program and adapt the marketing strategy accordingly.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                          | <p><b>10. Add customer contact details in the tracking sheet:</b> The Evaluator recommends adding customer contact details (phone number, email, etc.) in the same tracking tool as the one used to follow up on project progress and program impacts. This information can be entered either in the same sheet as the energy saving data or in a separate sheet of the same spreadsheet.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                          | <p><b>11. Break down the address information:</b> Currently, the address information (“<b>Location</b>” column) for each client is contained in one cell. This complicates site selection based on location for field activities. Presenting the address information in three cells (street address, city and postal code) will greatly facilitate this process.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Program Design and Implementation</b> | <p><b>12. Adjust the eligibility criteria to include projects that partly comply with the CPG because of specific situations:</b> The program may be adapted to include projects that partly comply with the CPG but which cannot fully comply because of specific corporate requirements. For instance, the Evaluator met with a car retailer who was starting a new construction project. This new building was to be used for retailing luxury cars of a brand that had its specific and non-negotiable standards for indoor lighting level and technology. The former program participant told the Evaluator that he was interested in applying to the CINC program for this upcoming building construction project, but he decided not to do so because he knew in advance that he would not be able to comply with the CPG requirements on lighting power density (Criterion 2.7). Accordingly, the Evaluator recommends considering the development of a methodology to make eligible new constructions that may partly comply with the CPG but cannot fully comply due to a particular situation. ENSC should also define adjustments to the incentives and energy savings to be calculated. Nevertheless, such projects should comply with at least a minimum number of Core Performance Requirements to be eligible for the CINC program. As the CPG is built as a package, ENSC also mentioned that they were already exploring options for another tool that would perform comparable house simulations.</p> |

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| <b>Program Design and Implementation</b> | <p><b>13. Develop an evaluation plan in parallel with program design and development:</b> This program has no evaluation plan. The Evaluator strongly recommends that for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than it is during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific research topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.</p>                                                                                                                                                                                                                                                                                            |
|                                          | <p><b>14. Compare the actual building consumption with the design simulations and make appropriate adjustments (if required):</b> In regard to M&amp;V activities that are undertaken up to three years following program completion, the Evaluator recommends comparing the building real consumption to the modeling results. This will help assess the level of discrepancy between simulation and reality, and adjust the software if necessary. If the program allows the use of different software, this comparison could help identify which one is closest to reality. It was mentioned that the ABI would do this comparison for the projects undertaken under the NCCP path when data are available.</p>                                                                                                                                                                                                                                                                                                                                                                            |
|                                          | <p><b>15. Set performance indicators on project delivery process:</b> In different sections of the program manual there are references to time limits to perform a given task. With the aim of evaluating project delivery process efficiency, ENSC should establish performance indicators to monitor if such tasks are completed within the time frame predicted in the program theory.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                          | <p><b>16. Clearly define the CPG minimum requirements at the early stage of the CINC projects:</b> As mentioned earlier in this section, the Evaluator noticed that the M&amp;V step of the program process was an issue for program participants who conduct their projects under the NCCP path. The verification partner met during the process evaluation also highlighted this matter but mentioned that they were currently working jointly with the PM to specify in more detail the minimum documents required to reach CPG compliance. With this in mind, the Evaluator recommends providing the participants with the standardized minimum requirements document as soon as possible in the project process (at least before starting the construction work). Moreover, the Evaluator encourages ENSC to add more detail to the minimum requirements documents as well as to draw up a set of examples and/or templates of requirement documents that would comply with the CPG. This could help the participants ensure that they prepare and provide the proper documentation.</p> |

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| <b>Program Design and Implementation</b> | <b>17. Consider adding a commissioning component to the program:</b> The <b>Evaluator</b> believes that ENSC should consider promoting building commissioning in the program since it has been proven that an effective commissioning contributes to achieving the savings predicted by the modeling. The CPG already includes an enhanced building commissioning component that could be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Section of ENSC Website</b>           | <b>18. Change the description of the CPG:</b> On the second page of the program fact sheet, the CPG is referred to as a flexible program. The Evaluator considers that the CPG is more a tool than a program, and that the wording should be changed accordingly to avoid confusion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Relationship with Partners</b>        | <b>19. Offer a commissioning component and calibrate the modeling tools:</b> According to the verification partner, offering a commissioning component to several projects and calibrating the modeling tools with actual building consumption are two measures that could enhance program performance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Impact Evaluation</b>                 | <b>20. Conduct a separate complete evaluation for the CINC program:</b> In 2010, only one new construction project was included in the C&IC program. This project was implemented using a “whole building” approach and its savings accounted for a small percentage of total C&IC program impacts. As mentioned previously, the CINC program included nine projects in 2011 and generated almost 3 GWh per year of gross savings at the generator. The impacts of the CINC program are also expected to increase in the upcoming years. With this in mind, Econoler believes ENSC should conduct a separate complete evaluation for the CINC program in 2012. Moreover, a separate evaluation could help shed light on all the uncertainties in calculating the savings related to CPG compliance (technical documentation, building simulations from ABI, potential demand savings, etc.).                           |
|                                          | <b>21. Define different energy savings indices (in kWh/m<sup>2</sup>) depending on various factors:</b> The use of a general energy savings index for project savings calculations introduces a bias, especially because the small group of program participants is not necessarily representative of the building population in Nova Scotia. Consequently, the Evaluator recommends calculating a set of energy savings indices (in kWh/m <sup>2</sup> or kWh/ft <sup>2</sup> ) that would vary depending on factors such as building characteristics (type of HVAC systems), climate zones (there were two climate zones that have been used for building load simulations, namely the Greenwood and Shearwater airports) as well as the building market sector (office, retail and warehouse). Using such indices should lead to energy savings calculations per project that are closer to actual project savings. |

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| <b>Impact Evaluation</b> | <p><b>22. Review the simulation made for the warehouse typical building:</b> Through the impact evaluation process, ENSC submitted the spreadsheet “1 Measure Level Outputs – All Buildings.xlsx,” which showed the key results from the building simulations performed by the New Buildings Institute through its Advanced Buildings Program. When looking at the simulation results, the Evaluator noted an anomalous result in the warehouse simulations. In fact, the simulations show that applying the CPG would raise the energy consumption of such buildings when compared to a typical warehouse compliant with the Model National Energy Code for Buildings (MNECB) of 1997. The Evaluator estimates that this discrepancy is mainly due to the lighting power density criterion of the CPG<sup>18</sup>, which ranges from 6.34 to 14.79 W/m<sup>2</sup> in the CPG, whereas the MNECB-1997 prescribes a maximum light power density from 3.2 to 10.8 W/m<sup>2</sup>. As Criterion 2.1 of the CPG<sup>19</sup> states that the new building must comply with MNECB-1997 requirements, applying the light power density criterion of the CPG should not increase the new building energy consumption. In addition, the way the cross effects on the building heating systems are calculated should also be verified to ensure that these cross effects are not overestimated, which would explain why the CPG-compliant warehouse building consumes more than the typical MNECB-compliant warehouse building.</p> |
|                          | <p><b>23. Add a limited amount of peak demand savings in project impact calculations:</b> For 2011, ENSC did not calculate electricity demand savings for the CINC projects. When reviewing the New Buildings Institute’s simulations, the Evaluator noted that demand savings had actually been estimated for each building type. Even though such demand savings are very small per project, they could raise the overall impact of the program with future increases of program participant number. ENSC should also consider using an estimated diversity factor for the calculation of the demand savings per project. The diversity factor to be used could be based on the expected operation schedule of the new building. ENSC could also define a set of diversity factors depending on the future building usage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

<sup>18</sup> CPG, Criterion 2.7: Lighting Power Density, p. 54.

<sup>19</sup> CPG, Criterion 2.1: Energy Code Compliance, p. 43.

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| <b>Impact Evaluation</b> | <p><b>24. Consider redefining the CPG baseline taking into account up-to-date construction practices:</b> The potential energy savings to be realized due to the implementation of the CPG are estimated using a facility built to the 1997 Model National Energy Code for Buildings (MNECB) as the basis for comparison.<sup>20</sup> Even though the MNECB 1997 is not mentioned as the baseline in the Feasibility Study Guide, the Evaluator strongly recommends undertaking a market study that would establish whether the MNECB was surpassed as the standard practice for new constructions, additions or major renovations. If it has been surpassed, the baseline will have to be adjusted accordingly.</p>                                                            |
|                          | <p><b>25. Use the PDA savings figures for estimating NCWB project savings:</b> Under the NCWB approach, the participants are asked to fulfill and sign a PDA with ENSC prior to starting the building construction. This PDA should include a feasibility study, which assesses the potential savings to be generated in the new energy-efficient building. When forecasting NCWB project impacts, it would be a good practice to always use the savings data from the PDA (when available) instead of placeholder savings factors (in kWh/m<sup>2</sup> or kWh/ft<sup>2</sup>). If the M&amp;V is not completed at the end of the year, the PDA savings figures would also be a better estimate of the actual project impacts than any general savings value per area unit.</p> |

<sup>20</sup> On page 11 of the CPG, the text refers to savings from 25 percent to 35 percent over beyond the performance of a building that meets the requirements of the MNECB 1997.



## APPENDIX II – PROGRAM THEORY

| <b>Commercial &amp; Industrial New Construction (CINC) Services</b> |                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <b>#</b>                                                            | <b>Program Theory</b>                                                                                                                                                                                                                                                                                                                                          | <b>Performance Indicators</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1                                                                   | In order to publicize the program and enhance participation, several marketing activities are undertaken involving program staff and many business-related organizations. These activities explain the advantages or justification of the savings by design approach for new constructions, major renovations and additions as well as the program components. | The marketing activities are numerous in this program such as distribution of posters and brochures, case studies, public speaking events by program staff, association with chambers of commerce, BOMA, IPOANS, TIANs, Cans, ASHRAE and other business-related organizations. For each activity, there should be a record describing the activity, date, attendance, etc. For activities that gather a group of persons, an evaluation sheet could also be collected to appreciate its impact and whether it meets expectations and possibly to improve the event. These performance indicators will be cross-validated with surveys among participants regarding the source of awareness in order to establish which ones were the most effective. |
| 2                                                                   | The program offers three types of technical assistance: modeling validation by an external consultant for those who chose the New Construction Whole Building (NCWB) path, educational and guidance activities to select the proper path and measurement and verification after the measures have been implemented.                                            | Selecting the right path will be captured in each project file. As for educational activities targeting engineers and architects, the sessions should be tracked with performance indicators such as the date and location, the type of attendees, their number and ultimately an evaluation form for each educational/training session.                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3                                                                   | The program offers incentives to offset the incremental cost of the energy efficiency measures and their study by a professional engineer. The level of incentives vary depending on the path chosen.                                                                                                                                                          | Tracking the incentives promised when the project is accepted by the Program Manager and the final incentive paid once the measures are implemented along with the date of payment. This ratio will establish the level of distortion of forecasted savings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| <b>Commercial &amp; Industrial New Construction (CINC) Services</b> |                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                     |
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| <b>#</b>                                                            | <b>Program Theory</b>                                                                                                                                                                                    | <b>Performance Indicators</b>                                                                                                                                                                                                                                                                       |
| 4                                                                   | Depending on the type of building and its size, the participant can select one of three paths: the New Construction Core Performance (NCCP) path, the NCWB approach or the prescriptive rebate approach. | This information should be in the program database. This performance indicator will allow establishing the most popular and unpopular paths for future program developments.                                                                                                                        |
| 5                                                                   | The Program Manager will support customers selecting the right path and will offer support as early as the preliminary stage of the project.                                                             | If the Program Manager or any program staff were involved in the project early stage, it should be mentioned in the project file and the program database. This performance indicator should establish the level of usefulness of the program staff support as one of the major program activities. |
| 6                                                                   | For the customers who select the NCWB approach, a feasibility study including a modeling of the new building is required and an incentive is provided for such studies.                                  | Indicate if there was such a study with the incentive paid. The executive summary of the study, if available, could also be captured in the program database.                                                                                                                                       |
| 7                                                                   | For those who select the prescriptive rebate approach, they are invited to participate in the Business Energy Rebates (BER) program.                                                                     | Keeping track of the number of projects that were directed to the BER program in order to appreciate the relative importance of such cases.                                                                                                                                                         |
| 8                                                                   | Once the feasibility study (for the NCWB approach) including building modeling is complete, it is validated by an exterior consultant under contract with ENSC.                                          | Tracking the results of the validation process in order to establish the quality of the simulations and their comprehensiveness. This will eventually be compared to the measuring and verification activity.                                                                                       |
| 9                                                                   | Once the project is approved by ENSC, the participant can start building. When the construction is completed, the incentive is paid as agreed in the Project Development Agreement (PDA).                | Same indicator as with link #3                                                                                                                                                                                                                                                                      |
| 10                                                                  | For better accuracy and control, each project, once completed, is measured and verified for a period of up to three years.                                                                               | Track measurement results and compare them with modeling results in order to improve, if necessary, the accuracy of some modeling software.                                                                                                                                                         |

| <b>Commercial &amp; Industrial New Construction (CINC) Services</b> |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <b>#</b>                                                            | <b>Program Theory</b>                                                                                                                                                                                                                                                | <b>Performance Indicators</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 11                                                                  | Depending on the path selected, savings are expected to be anywhere from 25 percent to more than 35 percent beyond the MNECB 1997.                                                                                                                                   | Track savings generated from each project into the program database and compare them with standard construction practices to appreciate the effectiveness of the program and whether it has really reached the predicted level of savings. This could be an important indicator to adjust the baselines, if necessary, particularly in the renovation business where baselines are very difficult to establish. Nevertheless, this comparison can be done but will be expensive as it would require a full "market" study specific to Nova Scotia builders. |
| 12                                                                  | The long-term outcome of this program is to convince engineers, architects, building managers and contractors that the savings by design approach is the best approach to capture lost opportunities of important savings and eventually become a standard practice. | This is a long-term indicator that cannot be tracked over a short period of time. Once every three years, a survey among professionals involved in new constructions, major renovations and additions could measure the degree of evolution of the savings by design practice.                                                                                                                                                                                                                                                                              |

## APPENDIX III – FIRMOGRAPHICS

Just under one-half of respondents (45%) report that energy costs are less than 10 percent of their annual operating budget, which marks a shift compared with 2010 respondents, when a number had energy costs that were 50 percent or more of their annual operating budget.

**Table 24: Energy Costs as a Percent of Annual Operating Budget**

| <b>Percent of Budget</b>                            | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011*</b> |
|-----------------------------------------------------|-------------|-------------|-------------|--------------|
| <i>Sample Size</i>                                  | <i>11</i>   | <i>8</i>    | <i>11</i>   | <i>27</i>    |
| Less than 10%                                       | 5           | 5           | 1           | 45%          |
| 10-19%                                              | 2           | 1           | 1           | 20           |
| 20-29%                                              | 2           | 1           | 2           | 10           |
| 30-39%                                              | 2           | --          | 1           | 15           |
| 40-49%                                              | --          | 1           | 1           | 5            |
| 50-59%                                              | --          | --          | 3           | --           |
| 60-69%                                              | --          | --          | 2           | 5            |
| 70-79%                                              | --          | --          | --          | --           |
| 80-89%                                              | --          | --          | --          | --           |
| 90-99%                                              | --          | --          | --          | --           |
| <b>Average Percent</b>                              | <b>12%</b>  | <b>12%</b>  | <b>37%</b>  | <b>17%</b>   |
| *Note: Don't know responses removed from 2011 data. |             |             |             |              |

Similar to previous years, respondents are more likely to be from the manufacturing sector (19%). A small number are in food sales (15%), education (11%), government (11%), or real estate (11%).

**Table 25: Business Type**

| <b>Business Type</b>                                  | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-------------------------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                    | <i>11</i>   | <i>13</i>   | <i>13</i>   | <i>27</i>   |
| Manufacturing                                         | 1           | 5           | 2           | 19%         |
| Food sales (grocery)                                  | --          | --          | 1           | 15          |
| Education                                             | 1           | --          | 1           | 11          |
| Government                                            | --          | --          | --          | 11          |
| Real estate/Property Management                       | --          | --          | --          | 11          |
| Health Care (inpatient)                               | --          | --          | --          | 7           |
| Service                                               | --          | --          | --          | 7           |
| Retail                                                | 5           | 3           | 8           | 4           |
| Warehouse and storage                                 | 1           | --          | --          | 4           |
| Enclosed and strip malls                              | --          | 1           | --          | 4           |
| Sports facility                                       | --          | 1           | 7           | --          |
| Fire station and civic center                         | --          | --          | 1           | --          |
| Cold storage/refrigeration                            | 2           | --          | --          | --          |
| Industry – mining/saw mill/foundry/metal distribution | 1           | --          | --          | --          |
| Distribution                                          | --          | 1           | --          | --          |
| Hospital                                              | --          | 1           | --          | --          |
| Heavy equipment repair                                | --          | 1           | --          | --          |
| Other                                                 | --          | --          | --          | 7           |

Four in 10 respondents work at organizations with 250 or more full time workers (41%), while two in 10 have between 100 and 249 full time workers (22%).

**Table 26: Full-time Equivalent Workers**

| <b>Full-time Equivalent Workers</b> | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>                  | <i>11</i>   | <i>13</i>   | <i>13</i>   | <i>27</i>   |
| Fewer than 5                        | --          | --          | 6           | 4%          |
| 5 to 9                              | --          | 2           | 2           | 7           |
| 10 to 19                            | 1           | 11          | --          | --          |
| 20 to 49                            | 2           | 3           | 1           | 11          |
| 50 to 99                            | 3           | 2           | --          | 7           |
| 100 to 249                          | 1           | 1           | 3           | 22          |
| 250 or more                         | 4           | 4           | --          | 41          |
| Don't know                          | --          | 1           | 1           | 7           |

Two-thirds (67%) of respondents are independent organizations, while one-quarter (26%) are part of a larger company, and seven percent are franchise.

**Table 27: Type of Company**

| Type of Company          | 2008      | 2009      | 2010      | 2011      |
|--------------------------|-----------|-----------|-----------|-----------|
| <i>Sample Size</i>       | <i>11</i> | <i>13</i> | <i>13</i> | <i>27</i> |
| Independent              | 2         | 2         | 7         | 67%       |
| Part of a larger company | 9         | 9         | 5         | 26        |
| Franchise                | --        | 1         | --        | 7         |
| Other                    | --        | 1         | 1         | --        |

Six in 10 respondents (59%) are in organizations with 5 or less locations.

**Table 28: Number of Business Locations in Nova Scotia**

| Number of Locations | 2011      |
|---------------------|-----------|
| <i>Sample Size</i>  | <i>27</i> |
| 1-5                 | 59%       |
| 6-10                | 7         |
| 11-20               | 11        |
| 21-50               | 7         |
| 100 and more        | 4         |
| Depends/Don't know  | 11        |

---

## **APPENDIX IV – INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Custom New Construction**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                         |
|-------------------------|
| <b>Source: Web Site</b> |
|-------------------------|

C: Program overview: Very good and short

### **Program Brochure Page 2**

Q: The Core Performance Guide is described as a Program. Is it really a program or a guide or tool with calculations or presumed savings by measure? (this is not a semantic question)

Q: The first level of incentive (\$10.76/square meter) uses the (MNECB) 97 as its base line. Have you checked if this corresponds to the standard practice? Since it's an old energy building code and it usually represents a minimum level of efficiency, it is often surpassed in recent new buildings. If this is the case, part of the predicted net savings over and above the code could be natural savings that will not be attributed to the program. Was there a study on the standard practice available when this program was initially designed? (*Please read the next question before answering this question*).

Feasibility Study Guide (the page numbers are not correct)

### **Page 1**

Q: Point 3.2 "Baseline" Here we mention the standard market practice as a base line and not the MNECB 97. Care to explain which one it is?

Q: Care to explain what do you mean by an artificial low baseline and how or by who is it established?

**Page 2**

Q: If you use required internal standard as a base line for some cases, would it still be that level even if its lower than the (MNECB) 97 requirements?

**Page 3 (M& V)**

Q: If you collect metering data for 3 years following building completion, do you validate the accuracy of your predicted savings calculations either presumed or simulated?

**Page 5 Point 6.2 Executive Summary**

Q: Do you have a compulsory form for the data and information contained in the executive summary? This kind of form helps data entries and extraction when you want to analyze or have an overview of the program performance. It usually helps identify strategic data that could be of great use to program modifications or improvements.

**Page 6 (Savings and Cost estimates)**

Q: your calculations are based on the simple payback period. Did you try to use the Net Present Value instead?

**Page 7**

Q: Is it ENSC that finance the eligible cost or are you outsourcing this service? If it's ENSC, does it create an additional workload?

|                               |
|-------------------------------|
| <b>Source: Program Manual</b> |
|-------------------------------|

C: The first section of that manual has no pages for references

C: This is a very well structured document. As most of the program manuals of ENSC, it is intended to two parties; the program administrator and the participant. It would be easier for the participant to have a section that concerns only him, since he is not interested in internal procedures.

Q: Do you have a participation flow chart that illustrates the different steps for the participants that could be a good support for the program manual writing?



### **In section 3.3 Eligibility**

Q: Must the participant be a client or future client of NSP? If not, is he eligible? Why not?

#### **In section 3.3.1 Free-Ridership**

C: If this manual is intended for both the program administrator and the participant, it is strange to read the first paragraph. They will rapidly know how to answer to be illegible for an incentive.

Q: in several sections concerning internal process procedures, there are time limits in terms of days to perform a given task. Do you keep track of the time delays for all of these steps to appreciate if you comply with them or if they need to be modified?

#### **In section 4.3.3**

C: Avoid using different terms for the same program component such as (detailed energy audit (feasibility study)). It could be confusing for the participant.

#### **Section 4.4.2**

Q: Does the fact that the program is capped to availability of funds created any problem so far? These are projects that could take more than a year or two to complete and such a cap can be a serious barriers to participants. Did you have to refuse projects because of that limitation?

##### **Section 4.4.2.2**

C: The 85% ratio for incentive of the total program budget seems a very good ratio for a new program. I have to congratulate you if this is the case.

Q: I understand that you do not allow reduction of simple payback under one year, which is very comprehensible. But is the higher level of payback before incentive taken into consideration also. For example I don't think you will accept a measure with a simple payback of, let's say 8 years to bring it back to more than 1 year. So is the formula under this section limits automatically the payback period for some measures?

##### **Section 4.6.1**

Q: For this Savings By Design type of program, once the construction is completed, some program have a commissioning components to optimize savings. Do you have any plan for commissioning?

**Form 4 Standard Project Development Agreement**

Q: your legal department has reviewed this contract?

Appendix D Contact Center Staff Training Material

Q: for whom is this intended (staff or participants)? It is not clear what the title means.

Appendix G: Communication

Q: It seems that you have a comprehensive series of activities for the marketing of that program. Do you have a detailed marketing plan describing the activities with each party? If so, do you collect performance indicators of all these activities?

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: is there a program logic model?

Q: When the program was initially designed did it include some distortion effects (free-riders, spillover) and were they quantified to establish net savings?

Q: Do you perform the cost effectiveness test post impact evaluation?

Q: Can you describe briefly who are the program partners and what are their roles? This is to help us ask the appropriate questions to the program partners for the process evaluation.

Q: When this program was designed initially did it include an evaluation plan?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner?

Thank you very much for your time and cooperation.

---

**Process Evaluation**

**Program Name: Custom Existing**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: Evaluation report 2010</b> |
|---------------------------------------|

**Page I**

Q: Even though the evaluator stated that the program is very well run, staff constraints have created a bottleneck for treating new demands and some data errors were mentioned. What is the status of these findings?

**Page II**

Q: Since demand savings were under target, was there anything in the design of the program to increase demand savings?

Q: Are the "Sales Leads" part of ENSC team?

C&I –R2 What is the status of this recommendation?

C&I –R3 What is the status of this recommendation?

C&I – R6 What is the status of this recommendation?

C&I – R8 What is the status of this recommendation?

**Page 16**

C: Program goals and design are clear and well explained. The program illegibility criteria are from best practice.

Q: Who pays for the M&V?

Q: Who establish the M&V protocols?

Q: Are the savings attributed to the program after M& V is completed?

**Page 17**

Q: Incentives could not exceed 0.15 \$ per kWh of the first year projected savings. Are there different levels of savings for the other years? This is not very clear to me.

Q: For the second bullet (Incentive could not exceed...), maybe an example can clarify that condition?

Q: For the free ridership method, are you classifying FR as complete FR and not FR or do you attribute % of FR depending on the answers and some weight you allocate to each question and answer?

Q: If it's a % that means that you are applying the FR ratio on the savings of each project?

Q: Do you consider that your method to establish FR is subject to interpretation of each evaluator? Can this interpretation be different from one client to another?

**Page 18**

Q: Do you track Sales Leads activities and their outcome?

Q: What is the percentage of leads that ended up in participation?

Q: In table 3-2 , the contractor role has fallen down dramatically in 2010 (8%) compared to 46% in 2009. Was that investigated?

**Page 19**

C: In table 3-3, past participation could reduce the level of FR if you can prove that their past participation has influenced them to participate in that program. In other words when he tells you that he was planning to implement the project, it might be because of his experience with his past participation to one of ENSC programs.

**Page 20**

Q: In table 3-4 the chronological data do not vary very much (and the reasons are not surprising). Do you wish to continue with this series?

**Page 22**

C: Table 3-6 could be used to design new programs specific to a given measure that is very popular (lighting retrofit)

Q: Do you simply want to identify spillover or do you want to quantify the savings? (this is a very complex methodology, especially for non-participant spillover)

C: When you refer to spillover, you should specify what kind of spillover (participants or non-participants)

|                         |
|-------------------------|
| <b>Source: Web Site</b> |
|-------------------------|

Energy Savings Account (ESA)

Q: What are the historical % for each category?

#### **Form 1 page 1**

C: You are using 2 different terms to designate the same product: Energy Audit and Scoping Study. For consistencies purposes, it would be advised to always use the same term in all the program literature.

C: Point 3, is a very good recommendation due to frequent modification in the program content, even though the form has a version number.

Q: You do not approve the proposal of an energy audit before it is performed. Participants submit the findings of the audit. What is the proportion of requests that were refused based on this approach?

#### **Form 1 page 3**

C: Eligibility # 4 very good eligibility condition.

#### **Form 2 # 5**

C: The maximum of 15 000\$ is not mentioned in this section.

#### **Form 3 page 1**

C: This form is an example, but it is written in small characters hidden in the top right hand scare. It could be easier to identify it if the word example was printed across the whole page.

#### **Form 4 pages 1 to 5**

C: We suppose that your legal department has approved this document.

**Feasibility Study Guide Page 1 # 3.0**

Q: It is not clear if you accept an already done detailed study that an incentive could be paid from the implementation incentive component of the program. I suppose that the measures will have to be implemented prior to receiving the incentive?

**Page 2 4.2.1**

Q: End of useful life: The base case would be any option: Do you look for standard practice in the market to establish the base case?

Q: Equipment still functioning: If there is a level of standard practice, do you calculate savings based on the early replacement principle (a stair approach)?

**Page 4 6.2**

Q: Are all the projects measured?

Q: Who decides what protocol to use in each project (A'B'C or D) and if it's not ENSC do they get your approval first?

**Page 9**

Q: Is this checklist for the participant?

**Page 11**

Q: As the program manager of that program, how would you describe your experience using the 6 sections of this document? (4 forms plus the standard project development agreement and the feasibility study guide)

**Program overview**

C: This is very good process flow chart for the participant.

Q: On-Bill financing is available only for NSP clients. Does it mean that clients from municipality's utilities are not eligible for that type of financing? If so why?

|                               |
|-------------------------------|
| <b>Source: Program manual</b> |
|-------------------------------|

C: The program manual has an impressive amount of information. For the PM it's good to have all the documents in one manual. But this manual contains information for the participant and also for the program managers. It could be wise to split it into different sections, one for each party concerned, so the participant can find only what is intended to him. Sections 4 (page5) to appendix A are all section concerning the program managers and should not be available for the participant. Care to comment?

Q: In the appendix A, we count eleven (11) forms for that program. Could that be a reason for any bottleneck in tracking the program data and entering them in a centralized database?

C: Custom Client Response Process (after appendix A)

Q: What is the purpose of this form?

Q: We could not find appendix B that is supposed to describe the methodology for FR screening?

#### **Appendix D**

C: There are no pages in that appendix.

#### **Page 2**

Q: Beside the outreached activities described in table 1, do you have a written marketing strategy and if so do you collect performance indicators for these activities?

C: The logic model is very well done

#### **Appendix E& F**

C: There are no pages in that appendix and it seems to be for the PM only and of no interest to the participant.

#### **Appendix H**

C: This should be for the participant in case you decide to split the manual.

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Could you please describe briefly who are your major partners in the program (ex. Verifiers, coordinators, etc.) how many are they and what are their specific roles. This will help us asking the proper questions for the process evaluation.

Q: While designing the program, was there any theory about the existence of distortion effects (free-riders and spillover) and did you predict their importance?

Q: If there was spillover effects forecasted, was it for participants or non-participants or both?

Q: Do you do cost effectiveness test post evaluation?

Q: When the program was initially designed, was there an evaluation plan designed concurrently?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database? (1 is very difficult 10 is very easy)

Q: Any other subject the PM wishes to include in the process examination of the program partners and or participants.

Thank you very much for your time and cooperation.



---

## **APPENDIX V – INTERVIEW GUIDE WITH VERIFICATION PARTNERS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Custom (New Construction)**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it. If a question does not apply to you, just check the Not Applicable box.

Please complete this form within the next 48 hours, [save the file](#) and send it at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator and/or the Project Coordinator?**

**Program Administrator Score:**

☐ Not applicable

**Project Coordinator Score:**

☐ Not applicable

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

☐ Yes

**What was (were) the complaint(s) about?**

☐ No

☐ Don't Know

☐ Refused

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

- ☐ Not applicable

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No

## **Part II: Questions Specific to the Custom Program (New Construction)**

**Q9- As a Verification Partner, in which of the following program components are you involved?**

- ☐ The feasibility study for projects that use the Core Performance Path
- ☐ The feasibility study for projects that use the Whole Building Path
- ☐ Participant in the kick-off meeting with ENSC and the client
- ☐ Site inspections
- ☐ Measurement & Verification (M&V)
- ☐ Design assistance, if needed
- ☐ Other

**Q10- In your opinion, once the projects are terminated, do you believe that ENSC should:**

- ☐ Enhance the program by offering a commissioning component to some of the projects
- ☐ Calibrate the modeling tools with the real building consumption once it has been occupied for a certain number of years

**Q10a- Do you verify all the projects?**

- ☐ Yes
- ☐ No

**Q11- If you answered No to Q10a, please describe what are the selection criteria for choosing the projects that you verify.**

**Q11a- As an outside Verification Partner, other than with the Project Technical Coordinator of ENSC, do you discuss some of the project elements with:**

- ☐ The participant (client)
- ☐ The participant's consultant
- ☐ The Contractor or future building operator

**Q11b- If you checked one or the two options for Q11a, on a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with each of them?**

The participant (client):

The participant's consultant:

Contractor or future building operator:

**Q11c- If your answer to Q11a was equal to or less than 8 for any party, would you care to share the reason or reasons for such a score?**

Participant:

Participant's consultant:

Contractor or future building operator:

**Q12 – We would like your opinion on the number of parties involved in this program.**

**Q12a- Other program parties like you. Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion
- ☐ Not applicable

**Q12a1- If you answered Too Few or Too Many, please comment:**

**Q12b- As for organizations other than ENSC. Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion
- ☐ Not applicable

**Q12b1- If you answered Too Few or Too Many, please comment:**

**Q13- Did you witness or experience any confusion in the market in regard to the different roles of:**

**Other program parties**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Other organizations involved in the program**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Q14- What is your opinion in regard to program on-course modifications?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

☐ Not applicable

**Q15- What is your opinion in regard to the interruption or premature ending of the program due to lack of funds or any other reason pertaining to the way you conduct your business?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

☐ Not applicable

**Q16- Did you receive any complaints from other program parties?**

☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party.)

☐ No

☐ Don't know

☐ Not applicable

**Q16a- What was the complaint about?**

**Q17 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

**PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM****PARTICIPANT'S PROFESSIONAL ENGINEER****Program Name: Custom Program (Existing Commercial and Industrial)****How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it. If a question does not apply to you, just check the Not Applicable box.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

**Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator and/or the Project Coordinator?**

Program Administrator Score:

☐ Not applicable

Project Coordinator Score:

☐ Not applicable



**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

☐ Yes

**What was (were) the complaint(s) about?**

☐ No

☐ Don't Know

☐ Refused

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

- ☐ Not applicable

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No

## **Part II: Questions Specific to the Custom Program (Existing Commercial and Industrial)**

**Q9- As the Participant's Consultant, in which of the following program components are you involved?**

- ☐ The Initial Energy Audit (Scoping Study)
- ☐ The Feasibility Study
- ☐ The Standard Project Development Agreement
- ☐ Site inspections
- ☐ Measurement and Verification (M&V)
- ☐ Bringing projects and applications to the attention of the ENSC Business Development Team

**Q10- Are you involved in all projects submitted by your clients to ENSC?**

☐ Yes

☐ No

**Q1- If you answered No to Q10, please describe what are the selection criteria for choosing the projects in which you are involved? 0a**

**Q12- Is your involvement in projects of each participant mandatory?**

☐ Yes

☐ No

☐ Some

**Q12a- If you answered Some, please explain on what basis your involvement is required.**

**Q13- As an outside Consultant, do you discuss or consult with the Project Technical Coordinator of ENSC?**

☐ Yes

☐ No

☐ Not applicable

**Q14 – We would like your opinion on the number of parties involved in this program.**

**Q14a- Other program parties like you. Are they?**

☐ Too few

☐ Adequate

☐ Too many

☐ No opinion

☐ Not applicable

**Q14a1- If you answered Too Few or Too Many, please comment:**

**Q14b- As for organizations other than ENSC. Are they?**

- ☐ Too few
- ☐ Adequate
- ☐ Too many
- ☐ No opinion
- ☐ Not applicable

**Q14b1- If you answered Too Few or Too Many, please comment:**

**Q15- Did you witness or experience any confusion in the market in regard to the different roles of:**

**Other program parties**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know
- ☐ Not applicable

**Other organizations involved in the program**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know
- ☐ Not applicable

**Q15- What is your opinion in regard to program on-course modifications?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion
- ☐ Not applicable

**Q16- What is your opinion in regard to the interruption or premature ending of the program due to lack of funds or any other reason pertaining to the way you conduct your business?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion
- ☐ Not applicable

**Q17- Did you receive any complaints from other program parties?**

- ☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party.)
- ☐ No
- ☐ Don't know
- ☐ Not applicable

**Q17a- What was the complaint about?**

**Q18 – In your opinion, what are the main barriers to the implementation of that program by order of importance?**

**Q19 – We would like to have your opinion on program performance regarding the two possible financial options which the program is offering (Energy Savings Account and C&I Custom Direct Enrollment).**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX VI – INTERVIEW GUIDE WITH PARTICIPANTS**

### **In-Depth Interviews**

#### **ENSC C&I Custom Program**

November 4, 2011

This questionnaire includes open questions to be asked to participants met during in-depth in-person interviews. These questions aim to identify any potential energy efficiency projects implemented, or currently being pursued, without the support from the Custom Program, but which may have been influenced by the program participation (spillover questions). In addition, this questionnaire should help shed light on the participant's satisfaction in the program process and outcomes.

### **Questions on other Potential Energy Efficiency Initiatives**

- A1. Why did your company or organization choose to participate in the Custom Program? Was it for the program incentives? For the green concepts (reducing energy consumption and carbon footprint, helping protect environment, etc.)? Please develop.

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- A2. If applicable, who recommended you to participate in this program?

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A3. Was there any energy efficiency measure recommended in this feasibility study that you decided not to implement through the program? If yes, could you name them (or at least those you recall)?

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*List of typical energy efficiency measures, for reference purposes only:*

1. *Lighting measures*
2. *Compressed air measures*
3. *HVAC system measures*
4. *Refrigeration measures*
5. *Motors and drives measures*
6. *Other energy-efficiency measures? (specify*

A4. Did you implement, or are you implementing, some of these measures? Did you implement, or are you implementing other measures? Please develop on the implementation status of all measures.

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A5. (If yes to A4) Do you have any financial support for implementing the measures you mentioned in the previous question? If yes, could you name the program(s)?

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- A6. (If yes to A4) Could you develop on the influence of the Custom Program on your decision to implement the energy efficiency measures mentioned in question A4?

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- A7. In the future, do you intend to develop and/or implement additional energy efficiency measures without ENSC financial support? If yes, what was the influence of your experience with the Custom Program on your decision?

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## Satisfaction Questions

- B1. In general, how was your company or organization's experience with the Custom Program?  
Please develop.

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- B2. More precisely, could you comment the following aspects of the program support offered to participants?

Interaction and communication with staff: \_\_\_\_\_

Availability of staff: \_\_\_\_\_

Interaction and communication with contractors/consultants: \_\_\_\_\_

The rebate and/or incentive amounts granted: \_\_\_\_\_

Paperwork and procedures required to receive rebate or incentives: \_\_\_\_\_

- B3. What have been the challenges and/or barriers you faced in implementing the energy efficiency measures? Please consider all measures implemented or currently being pursued through the Custom Program.

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B4. More specifically, what are the positive and/or negative comments you have for the way each project phase has been conducted (please comment only the project phases undertaken with the support of ENSC, under the Custom Program):

Project Discovery: \_\_\_\_\_

\_\_\_\_\_

Scoping Study: \_\_\_\_\_

\_\_\_\_\_

Feasibility Study: \_\_\_\_\_

\_\_\_\_\_

Standard Project Development Agreement: \_\_\_\_\_

\_\_\_\_\_

Measurement and Verification of Performance: \_\_\_\_\_

\_\_\_\_\_

Implementation Incentive Claim: \_\_\_\_\_

\_\_\_\_\_

*List of typical significant barriers, for reference purposes only:*

1. (concern that actual bill savings would be less than estimated)
2. (lack of information to make an informed decision)
3. (rebate/incentive was too little)
4. (paperwork/process required too much work / too much work to obtain funding)
5. (too little information about the program)
6. (cost savings not worth the effort of applying)
7. (approval takes too long)
8. (lack of financing)
9. (energy efficient equipment does not meet payback requirements)
10. (decision made elsewhere)
11. (do not own building – have to work through owner)
12. (lack of technical knowledge)
13. (lack of time / too busy)
14. (focused on core business)

B5. Do you have any suggestions on how to improve the Custom Program? Consider all aspects and phases of the program previously mentioned.

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B6. Anything else to add (or additional notes)?

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Thank you very much for your time and cooperation.

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## **APPENDIX VII – PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

#### **ENSC C&I Custom Program**

November 24, 2011

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “Perhaps you can help me anyway.” GO TO INTRODUCTION]

[INTRODUCTION]

Hello, my name is \_\_\_\_\_ and I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your firm recently participated in Efficiency Nova Scotia Corporation’s Commercial and Industrial Custom Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

### **Verification and Recall [V series]**

V1. The Custom program helps businesses implement electrical energy-saving projects. The Custom program offers technical assistance, financial incentives and financing to offset the cost of engineering studies, energy efficiency equipment and installation.

Our records indicate that your company or organization participated in Efficiency Nova Scotia’s Custom Program in 2011. Is this correct?

1. Yes (Go TO V3)
2. No

- V2. Is there someone else at your company or organization who would know about your company or organization's participation in Efficiency Nova Scotia's Custom Program?
1. Yes (Ask for name: \_\_\_\_\_ and telephone #: \_\_\_\_\_) (Thank and terminate; schedule interview with best contact)
  2. No (Thank and terminate)
- V3. Are you the person in your company or organization who is most knowledgeable about your experience with the Efficiency Nova Scotia's Custom Program?
1. Yes (if YES go to P1)
  2. No
- V4. We would like to talk to the person who is the most knowledgeable about your experience with the Efficiency Nova Scotia's Custom Program. Could you give me the name and telephone number of this person? [Probe this individual may be an engineer, equipment contractor, or utility account manager].
- Name: \_\_\_\_\_
- Telephone #: \_\_\_\_\_
- (Note: Thank and terminate call. Schedule interview with best contact regarding experience with the program.)

## **Reasons for Participating [P series]**

- P1. Did your company or organization participate in any other Nova Scotia Power or Efficiency Nova Scotia energy efficiency programs before the Custom Program?
1. Yes
  2. No (Go to P4)
  98. (Don't know) (Go to P4)
  99. (Refused) (Go to P4)
- P2. (If P1 = YES) Which programs did your company or organization participate in prior to the Custom Program? **(Please specify program(s). If cannot recall the program names include a short description.)**
- a. \_\_\_\_\_ Program 1
  - b. \_\_\_\_\_ Program 2
  - c. \_\_\_\_\_ Program 3
  - d. \_\_\_\_\_ Program 4

P3. **(REPEAT FOR EACH PROGRAM IDENTIFIED IN P2)** In what year did your company or organization participate in [Program x]? **ACCEPT MULTIPLE YEARS**

1. Before 2000
2. 2000
3. 2001
4. 2002
5. 2003
6. 2004
7. 2005
8. 2006
9. 2007
10. 2008
11. 2009
12. 2010
13. 2011
98. (Don't know)
99. (Refused)

P4. How did you learn about the Custom Program? [RANDOMIZE AND READ 1-7, THEN 96]  
**(multiple responses)**

1. From Efficiency Nova Scotia literature
2. From Efficiency Nova Scotia presentation
3. From Efficiency Nova Scotia staff person
4. From Efficiency Nova Scotia's website
5. From a contractor or vendor
6. From a business associate or friend (word of mouth)
7. From someone who had previously participated in the Custom Program
96. Or some other way? (Please specify: \_\_\_\_\_)
98. (Don't know)
99. (Refused)

P5. What was the **SINGLE** most important reason your company or organization chose to participate in the Custom program? **(DO NOT READ – accept one response)**

1. (to take advantage of program incentives)
2. (this was part of an already planned project)
3. (to save on energy costs/bills)
4. (to reduce maintenance costs)
5. (to improve existing lighting conditions)
6. (to find ways to reduce carbon footprint)

- 7. (to help protect the environment)
- 8. (to replace non-working equipment)
- 9. (recommended by utility account rep)
- 10. (recommended by a contractor)
- 11. (past participation in another utility program)
- 96. (Other: Please Specify: \_\_\_\_\_)
- 98. (Don't know) (Go to P7)
- 99. (Refused) (Go to P7)

P6. What was the SECOND most important reason your company or organization chose to participate in the Custom program? **(DO NOT READ – accept one response – SAME LIST AS P5)**

P7. Some companies work with a design professional, project architect, engineer, equipment contractor, or a utility account manager as part of the project design phase. Who do you feel was more responsible for specifying the measures to install through the Custom Program? Was it ...: [RANDOMIZE, READ, ACCEPT ONE RESPONSE]

- 1. An Outside design professional
- 2. A Contractor
- 3. A Manufacturer representative
- 4. A Utility account manager
- 5. Someone within your company or organization
- 96. (Other, please specify: \_\_\_\_\_)
- 98. (Don't know/Don't recall)
- 99. (Refused)



## **FREE-RIDERSHIP [FR series]**

According to our information, through its participation in the Custom Program, your business or organization received incentives to implement electrical energy-saving projects in one or several facilities or buildings. When answering the survey questions, please take into account only those Nova Scotia facilities or buildings where your company implemented energy-saving projects through the Custom program.

FR1. **Before participating** in the Custom Program, did your company or organization have plans to implement the specific energy efficiency measures that were implemented through the Custom Program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**RFR1a. IF FR1=YES, THEN ASK:** I just want to make sure I understand - **Before** you decided to participate in the Custom Program, you had already made the decision to implement the energy efficiency measures you implemented through the program?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Custom Program.

If your company or organization had not participated in the Custom Program, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you "Definitely **Would Not** Have Taken the Action," and a 10 indicating that you "Definitely **Would Have** Taken the Action." AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: "AND NEXT, In the absence of the Program, would you have . . . : DO NOT ACCEPT A RANGE – POSE FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. implemented exactly the same energy efficiency measures that you implemented through the program?

\_\_\_ Response                      \_\_\_ 98 Don't Know     \_\_\_ 99 Refused

FR2b. installed standard equipment instead of energy-efficient equipment?

\_\_\_ Response                      \_\_\_ 98 Don't Know     \_\_\_ 99 Refused

FR2c... implemented exactly the same energy efficiency measures that you implemented through the program, *but at a later date*?

\_\_\_ Response                      \_\_\_ 98 Don't Know     \_\_\_ 99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT POSE FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your response to the previous question that if the Custom Program had not been available there was an X in 10 likelihood that you would have implemented the same energy efficiency measures *but at a later date*. Approximately how many months later would you have implemented these measures? **DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE**

1. \_\_\_\_\_ months later
2. (Never)
3. (At the same time)
98. (Don't Know)
99. (Refused)

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within . . .

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3. As part of its Custom Program, Efficiency Nova Scotia offers financial incentives and on-bill financing to help the implementation of energy-saving projects. If your company or organization had not received the financial incentives and/or on-bill financing from Efficiency Nova Scotia, would you have paid and/or financed the full cost of the project you implemented? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Paid and/or Financed” and a 10 indicating that you “Definitely **Would** Have Paid and/or Financed.” PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_ Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR4. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to implement the energy efficiency measures you implemented through the program. Using a scale from 0 to 10, where 0 means “Not at all important” and 10 means “Extremely important”, please rate the importance of each of the following in your decision to implement the energy efficiency measures you implemented through the Program. [RANDOMIZE – READ - DO NOT ACCEPT A RANGE]

[RECORD RESPONSE 0-10; 97=NON APPLICABLE; 98=DON'T KNOW; 99=REFUSED]

- a. The program financial incentives and/or on-bill financing STATE IF ASKED WHAT ‘ON BILL FINANCING’ IS: Efficiency Nova Scotia’s Custom program offers on-the-bill financing of eligible costs for qualified Custom program customers seeking such financing.
- b. The recommendations and technical assistance provided by the program when my company was engaged in discussions with contractors and consultants about equipment choices
- c. The technical assistance offered by the program during the project implementation and the Measurement & Verification process
- d. The funded preliminary energy audit scoping study
- e. Your company or organization’s corporate policy or guidelines regarding the purchase of equipment
- f. The standard practice in your industry
- g. The existing energy efficiency code
- h. Previous experience with the Custom Program or a similar program either from Efficiency Nova Scotia or Nova Scotia Power

## **SPILLOVER [SO series]**

SO1. Now I'd like you to think at the energy efficiency measures that were recommended in the feasibility study you conducted through the Custom program. Was there any energy efficiency measure recommended in this feasibility study that you decided not to implement through the program?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

[IF SO1 = 2 OR 98 OR 99, GO TO S Series]

SO2. [ASK IF SO1=1] Which of the following energy efficiency measures were recommended in your feasibility study but that you decided not to implement under the program? [ASK FOR EACH ITEM]

[1 = YES, RECOMMENDED, 2 = NO, NOT RECOMMENDED, 98 = DON'T KNOW / DON'T REMEMBER, 99 = REFUSED] READ AND ROTATE – ALWAYS POSE 'F' LAST

- a. Lighting measures
- b. Compressed air measures
- c. HVAC (heating, ventilating and air conditioning) system measures
- d. Refrigeration measures
- e. Motors and drives measures
- f. Other energy-efficiency measures? (specify)

[ASK SO3 FOR EACH ITEM IN SO2 ANSWERED BY YES (SO2a-f=1)]

SO3. Why did you decide not to implement the [SO2 'YES' RESPONSE] that were recommended in your feasibility study? [DO NOT READ]

1. (Too complicated to install or implement)
2. (Cost too much)
3. (Did not need these measures)
4. (Did not want to change, actual equipment works fine)

5. (Did not believe it will result in lower energy bills)
6. (Did not trust in energy professionals installing new measures)
96. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

You mentioned in a previous answer that there were some recommended measures in the feasibility study that you decided not to implement through the program.

SO4. **Since the time that you** participated in the Custom Program, have you implemented some of these recommended measures?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

SO5. [ASK IF SO4=1] Which one or ones?

| [LIST OF ELEMENTS<br>RECORDED AS YES IN S02<br>(S02a-f=1)] | Responses                                   |
|------------------------------------------------------------|---------------------------------------------|
| a. Lighting measures                                       | ___ Response ___98 Don't Know ___99 Refused |
| b. Compressed air measures                                 | ___ Response ___98 Don't Know ___99 Refused |
| c. HVAC system measures                                    | ___ Response ___98 Don't Know ___99 Refused |
| d. Refrigeration measures                                  | ___ Response ___98 Don't Know ___99 Refused |
| e. Motors and drives measures                              | ___ Response ___98 Don't Know ___99 Refused |
| f. Others: specify                                         | ___ Response ___98 Don't Know ___99 Refused |

## SATISFACTION [S series]

- S1. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how was your company or organization's experience with each of the following aspect of the Custom Program? If your company or organization did not have experience with one of the aspects please tell me. **[DO NOT RANDOMIZE, DO NOT ACCEPT A RANGE] [97 = Not Applicable, 98 = Don't know/Don't recall, 99 = Refused]**
- a. Interaction and communication with staff
  - b. Availability of staff
  - c. Interaction and communication with contractors/consultants
  - d. Initial confirmation of eligibility
  - e. Preliminary Energy Audit/Scoping Study
  - f. Preliminary Energy Audit/Scoping Study rebate amount
  - g. Feasibility Study/Assessment
  - h. Feasibility Study/Assessment incentive amount
  - i. Project Implementation
  - j. Project rebate amount
  - k. **[READ IF, IN DATABASE, FINANCING>0]** Program on-bill financing
  - l. Verification
  - m. Paperwork and procedures required to receive rebate or incentives
  - n. The program overall

## BARRIERS TO ACTIONS AND RECOMMENDATIONS [B series]

- B1. Were there any challenges or barriers that you faced in implementing these energy efficiency measures? Please consider all measures implemented or currently being pursued through the Custom Program.
1. Yes
  2. No **(SKIP TO B4)**
  98. (Don't know) **(SKIP TO B4)**
  99. (Refused) **(SKIP TO B4)**
- B2. What was the SINGLE most important barrier? **(DO NOT READ - ACCEPT ONE RESPONSE)**
1. (concern that actual bill savings would be less than estimated)
  2. (lack of information to make an informed decision)
  3. (rebate/incentive was too little)
  4. (paperwork/process required too much work / too much work to obtain funding)

5. (too little information about the program)
6. (cost savings not worth the effort of applying)
7. (approval takes too long)
8. (lack of financing)
9. (energy efficient equipment does not meet payback requirements)
10. (decision made elsewhere)
11. (do not own building – have to work through owner)
12. (lack of technical knowledge)
13. (lack of time / too busy)
14. (focused on core business)
15. (Other – SPECIFY: \_\_\_\_\_)
98. (Don't know) (SKIP TO B4)
99. (Refused) (SKIP TO B4)

B3. What was the SECOND most important barrier? **(DO NOT READ - ACCEPT ONE RESPONSE - SAME LIST AS B2)**

B4. On a scale of 1 to 5, where 1= 'not at all important' and 5 = 'very important', how important is **reducing energy usage** to your company or organization? **[98 = Don't know, 99 = Refused] do not accept a range**

B5. On a scale of 1 to 5, where 1= 'not at all important' and 5 = 'very important', how important is **managing energy costs** to your company or organization? **[98 = Don't know, 99 = Refused] do not accept a range**

B6. Approximately what percent of your annual operating budget do energy costs account for?  
**[998 = Don't know, 999 = Refused] do not accept a range**

\_\_\_\_ %

B7 Do you have any suggestions on how to improve the Custom Program? Consider all aspects of the program: Participation process or program components (preliminary audit/scoping study, feasibility assessment/study, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms. PROBE: Anything else?

- B8. Would a figure illustrating the various steps to follow in order to participate in the Custom Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?
1. Significantly
  2. Somewhat
  3. Slightly
  4. Not at all
  96. (Depends on what the figure or illustration would have been)
  97. (This kind of document already exist)
  98. (Don't know)
  99. (Refused)

## **FIRMOGRAPHICS [F series]**

- F1. What is the main activity of your company or organization? [DO NOT READ—BUT CONFIRM WITH RESPONDENT THAT THE CATEGORY YOU CHOOSE IS CORRECT]
1. Education
  2. Food Sales (grocery)
  3. Food Service (restaurant)
  4. Health Care - Inpatient
  5. Health Care - Outpatient
  6. Lodging
  7. Mercantile— Retail (Enclosed and Strip Malls)
  8. Mercantile – Retail (Other than Mall)
  9. Office
  10. Public Assembly
  11. Public Order and Safety
  12. Religious Worship
  13. Service
  14. Warehouse / storage
  15. Manufacturing (Identify Industry Type \_\_\_\_\_(e.g., chemical, food, paper, etc.)
  16. Other? \_\_\_\_\_
  17. Vacant
  18. Other (SPECIFY: \_\_\_\_\_)
  98. (Don't know)
  99. (Refused)



F3. Approximately how many full-time equivalent workers DOES YOUR COMPANY OR ORGANIZATION employ at all locations within Nova Scotia?

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or more
98. (Don't know)
99. (Refused)

F5. Is your company independent, or part of a larger company?

1. Independent
2. Part of a larger company
3. Other (\_\_\_\_\_)
98. (Don't know)
99. (Refused)

F6. How many business locations does your organization have in Nova Scotia? [RECORD A NUMBER 1-99; 998 = Don't know, 999 = Refused]

END.

Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## **APPENDIX VIII – ON-SITE VISIT PROTOCOLS**

The on-site visit protocols for the C&IC and CINC programs are attached in PDF format to this report.

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## **APPENDIX IX – ON-SITE VISIT SAMPLING PLAN**

This Appendix presents the step-by-step analysis carried out to identify the C&IC program sample based on five criteria, namely the project size, type and location, as well as the source of claimed savings and the participant's market sector.

### **1. PROJECT SIZE**

The respective size of the projects in terms of annual energy savings has been considered as the most important criterion for project sampling. In fact, adjustments to the larger projects in terms of energy savings have a heavier impact on overall program savings than do corrections on smaller projects. For instance, the six largest projects of the population account for nearly 50 percent of the total energy savings of the 40 projects. Hence, these six projects should be more likely to be included in the sample than the other 36 projects thanks to their respective effects on overall program impacts. In addition, the Evaluator realized that there was a high variability in claimed annual energy savings per project (it ranged from less than 25 MWh/year to more than 1,100 MWh/year). For these two reasons, it was decided that the project population would first be sampled according to their respective size before applying other selection criteria (such as the type of projects or the participants' market sector).

The forming of project size strata was made as follows. First, the number of strata had to be chosen. Research studies in stratification propose that significant gains in precision be usually obtained from the first few strata.<sup>21</sup> It is hence recommended forming only a few strata (two to ten strata), which will generally yield most of the potential benefits from stratification. For this particular case, the Evaluator elected to use only four strata mainly due to the small size of the population (40 projects). Second, the Evaluator set the stratum boundary points using the Dalenius and Hodge (1959) method<sup>22</sup>, also known as the approximate rectangular method. This method involves setting arbitrary intervals of the same size<sup>23</sup> and then calculating the square root of frequency of projects per interval.<sup>24</sup> The cumulative square root of frequencies divided by the chosen number of strata (four) gave the approximate boundary points to be used for stratum forming. The four strata were then formed accordingly, as shown in table below. An equal number of projects was finally sampled in each stratum (six projects per stratum), except for the 4th and largest stratum which included only five projects. All of these five projects were therefore automatically selected to be part of the final sample for on-site visits.

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<sup>21</sup> BUDDHAKULSOMSIRI, Jirachai et al., *A Stratified Sampling Plan for Billing Accuracy in Healthcare Systems*, University of Michigan-Dearborn.

<sup>22</sup> COCHRAN, William G., *Sampling Techniques – third edition*, John Wiley and Sons, Inc., New York, 1977.

<sup>23</sup> In the present case, the chosen interval sizes were 50 MWh/year of energy savings. It gave a total of 23 intervals. The frequency per interval ranged from 0 to 8 projects.

<sup>24</sup> Here, the use of the square root instead of the total savings for stratum boundary point calculation helps avoid overweighting the occurrence of the population's largest projects at the expense of the smallest in the sampling.

The next table presents the final breakdown of the population per project size in four strata, with the weight (in percentage) of each stratum along with the number of projects to be selected per stratum and their respective inclusion probability.

**Table 29: Breakdown of C&IC Projects by Size**

| Stratum      | Range of Annual Savings     | Number of Projects | Total Energy Savings (MWh/yr) | Percentage of Total Savings | Sample    | Inclusion Probability |
|--------------|-----------------------------|--------------------|-------------------------------|-----------------------------|-----------|-----------------------|
| 1            | Savings ≤ 100 MWh           | 14                 | 733                           | 7%                          | 6         | 43%                   |
| 2            | 100 MWh < Savings ≤ 250 MWh | 13                 | 2,021                         | 18%                         | 6         | 46%                   |
| 3            | 250 MWh < Savings ≤ 750 MWh | 8                  | 3,473                         | 32%                         | 6         | 75%                   |
| 4            | Savings > 750 MWh           | 5                  | 4,719                         | 43%                         | 5         | 100%                  |
| <b>Total</b> |                             | <b>40</b>          | <b>10,948</b>                 | <b>--</b>                   | <b>23</b> | <b>--</b>             |

As shown in the last table, the projects pertaining to the 4th stratum were automatically selected for incorporation into the sample. The next sampling criteria help identify the projects to be part of the selection for the three other strata.

## 2. SOURCE OF CLAIMED SAVINGS

As mentioned previously, the project status criterion was used to extract 40 implemented projects out of the 146 projects of 2011. After having applied the project size criterion, the Evaluator looked at the source of claimed energy and demand savings to guide project selection in stratum 1 to 3.

In the list of 40 projects, only two projects had their savings claimed from PDA while all the other had performed M&V to obtain energy and demand savings. As savings evaluated using M&V are considered less risky and more reliable than savings assumed from PDA, it was decided to prioritize projects for which M&V activities had already been performed over other projects.

### 3. PROJECT TYPE

The types of energy efficiency measures covered by the C&IC program are highly variable. In fact, only a few demand management measures are ineligible for the program, allowing participants to submit a wide range of energy efficiency projects for approval. This situation introduces a risk in impact evaluation since some types of energy efficiency measures are easy to verify while others require more efforts when it comes to measuring their realized energy savings. In accordance with this particularity of the program, it was decided to represent the distribution of the population of measure types as reliably as possible in the sample.

Pursuant to this objective, the 40 claimed projects were divided into five categories according to the type of measures implemented, as shown in the next table.

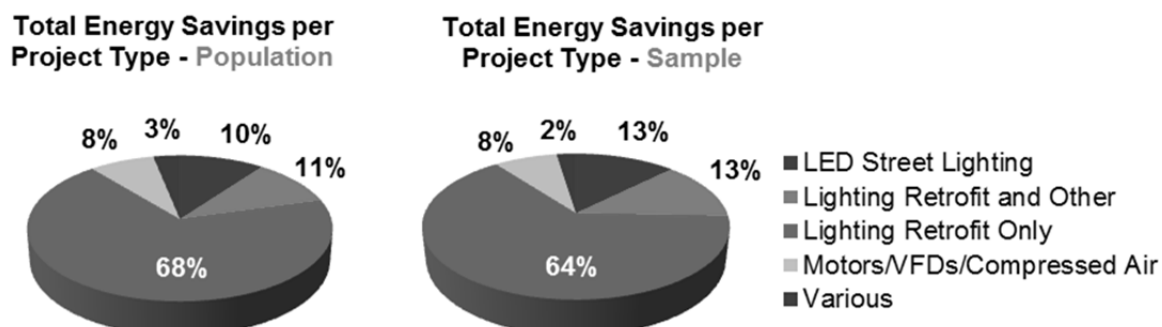
**Table 30: Breakdown of C&IC Projects by Project Type**

| Project Types               | Number of Projects | Total Energy Savings (MWh/yr) | Percentage of Total Energy Savings | Total Demand Savings (kW) | Percentage of Total Demand Savings |
|-----------------------------|--------------------|-------------------------------|------------------------------------|---------------------------|------------------------------------|
| LED Street Lighting         | 2                  | 1,117                         | 10%                                | 137                       | 10%                                |
| Lighting Retrofit and Other | 1                  | 1,149                         | 11%                                | 266                       | 19%                                |
| Lighting Retrofit Only      | 32                 | 7,483                         | 68%                                | 788                       | 57%                                |
| Motors/VFDs/Compressed Air  | 2                  | 856                           | 8%                                 | 98                        | 7%                                 |
| Various <sup>a</sup>        | 3                  | 348                           | 3%                                 | 96                        | 7%                                 |
| <b>Total</b>                | <b>40</b>          | <b>10,948</b>                 | <b>--</b>                          | <b>1,385</b>              | <b>--</b>                          |

<sup>a</sup> The “Various” category of energy efficiency measures includes the following types of projects: HVAC improvements, uninterruptible power supply (UPS) upgrades and projects described as “Various.”

After having automatically selected the five projects of the 1st stratum (refer to the Project Size criterion), it appeared that the “Street Lighting” and “Lighting Retrofit and Other” measures were overrepresented to the detriment of the “Lighting Retrofit Only” and “Various” measures. These two categories of energy efficiency measures were thus prioritized when selecting projects in the three other project size strata.

The measure type distribution of the final sample compared to the total population is shown on the figure below.

**Figure X: Comparison of Project Types for C&IC Program**


## 4. PARTICIPANTS' MARKET SECTOR

The participants' market sector is another factor that may influence project impacts. Actually, the notion of project feasibility and financial viability might vary significantly whether the project is carried out in industrial, commercial or municipal sector facilities. The sampling therefore took this market sector criterion into account.

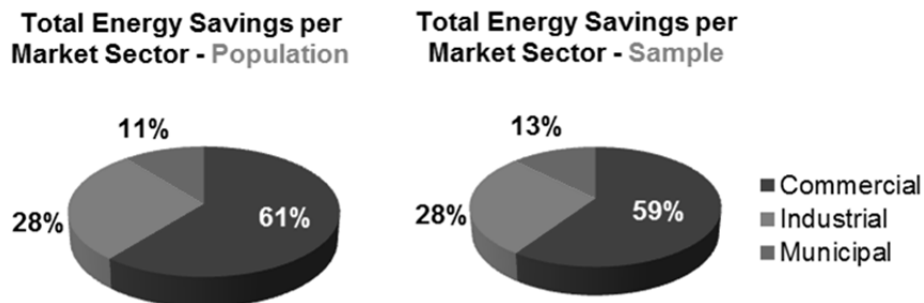
The next table presents the distribution of the project population by market sector (commercial, industrial or municipal).

**Table 31: Breakdown of C&IC Projects by Market Sector**

| Project Types | Number of Projects | Total Energy Savings (MWh/yr) | Percentage of Total Energy Savings | Total Demand Savings (kW) | Percentage of Total Demand Savings |
|---------------|--------------------|-------------------------------|------------------------------------|---------------------------|------------------------------------|
| Commercial    | 31                 | 6,665                         | 61%                                | 915                       | 66%                                |
| Industrial    | 6                  | 3,097                         | 28%                                | 325                       | 23%                                |
| Municipal     | 3                  | 1,186                         | 11%                                | 145                       | 10%                                |
| <b>Total</b>  | <b>40</b>          | <b>10,948</b>                 | <b>--</b>                          | <b>1,385</b>              | <b>--</b>                          |

The consideration of having a representative market sector distribution in the sample led to prioritizing commercial projects in project size strata 1 to 3 (refer to the Project Size criterion). The following figure compares the final sample distribution of total energy savings per market sector with that of the total population of 40 projects.

**Figure X: Comparison of Participants' Market Sector for C&IC Program**



## 5. PROJECT LOCATIONS

Finally, consideration was given to the respective project location in the sampling. For logistical purposes, projects which were located more than 200 km off the following four large urban centres were automatically removed from the sample: Halifax (Halifax County), Kentville (Kings County), New Glasgow (Pictou County) and Sydney Mines (Cape Breton County). This selection criterion led to the removal of three projects from the list of 40 eligible projects. These three projects were located in the Yarmouth and Shelburne Counties, i.e. more than 220 km away from the City of Halifax.

## APPENDIX X – ALGORITHM FOR FREE-RIDERSHIP CALCULATION

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did your company have plans to implement the specific energy efficiency measures that were implemented through the program ?                                                                                                                                                                      | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just want to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to implement the energy efficiency measures that you implemented through the program ?                                                                                                                          | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have implemented exactly the same energy efficient measures that you installed through the program? (Scale 0 to 10)                                                                                                                                              | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have installed standard equipment instead of energy -efficient equipment? (Scale 0 to 10)                                                                                                                                                                        | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)<br/>IF PRE-SCREENING : 0%</b>                                                                                                                |
| <b>FR3.</b> If your company had not received the rebate offered by the program, would you have paid for the full cost of the project, including the portion covered by the rebate? (Scale 0 to 10)                                                                                                                                                 | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3<br/>IF PRE-SCREENING : 0%</b>                                                                                                   |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c, d and h = Program factors<br>Factors f and g = Non Program factors                                                                                                                                                                                                              | FR4_P = SUM(a; b; c; d; h)<br>FR4_NP = SUM(f; g)                                                                                                                                 |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>100% -<br/>[FR4_P/(FR4_P+FR4_NP)]</b>                                                                                                                                         |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have implemented exactly the same energy efficiency measures <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                                         | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have implemented the measures?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>FR2cc</b>                                                                                                                                                                     |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                        | <b>MEAN VALUE OF:<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                                |





## 1. General Information

Site Visit Date: \_\_\_\_\_  
Project ID: \_\_\_\_\_ Contact Name: \_\_\_\_\_  
Project type: \_\_\_\_\_ Contact Phone: \_\_\_\_\_  
Company name: \_\_\_\_\_ Contact Email: \_\_\_\_\_  
Address: \_\_\_\_\_

List of people met during the visit: \_\_\_\_\_  
\_\_\_\_\_

Type of building: 

|                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|
| Commercial/institutional | <input type="checkbox"/> | Industrial/manufacturing | <input type="checkbox"/> |
| Municipal                | <input type="checkbox"/> | Other (specify)          | <input type="checkbox"/> |

 Specify: \_\_\_\_\_

## 2. Facility Operation Schedules

**Facility annual schedule:** *Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

| Description                                                               | 1 - Normal Schedule |          | 2 - Specify: |          | 3 - Specify: |          |
|---------------------------------------------------------------------------|---------------------|----------|--------------|----------|--------------|----------|
|                                                                           | Weekdays            | Weekends | Weekdays     | Weekends | Weekdays     | Weekends |
| Number of day with regular schedule per year                              |                     |          |              |          |              |          |
| Number of day with regular holidays schedule per year                     |                     |          |              |          |              |          |
| Number of days with no occupancy per year (For example: seasonal closure) |                     |          |              |          |              |          |
| Total number of day per year                                              |                     |          |              |          |              |          |

**Facility daily schedule:** *Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

| Schedules                           |                                       | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Holidays |
|-------------------------------------|---------------------------------------|--------|---------|-----------|----------|--------|----------|--------|----------|
| <b>Schedule 1: Normal</b>           | Time of use (e.g. 8:00 am to 5:00 pm) |        |         |           |          |        |          |        |          |
|                                     | Hours per day                         |        |         |           |          |        |          |        |          |
| <b>Schedule 2 (specified above)</b> | Time of use                           |        |         |           |          |        |          |        |          |
|                                     | Hours per day                         |        |         |           |          |        |          |        |          |
| <b>Schedule 3 (specified above)</b> | Time of use                           |        |         |           |          |        |          |        |          |
|                                     | Hours per day                         |        |         |           |          |        |          |        |          |

### 3. Building Heating/Cooling System Description

#### Heating Systems

*Please fill the table below for each heating system at the site*

| Description                                                               | Heating system 1 | Heating system 2 | Heating system 3 | Heating system 4 |
|---------------------------------------------------------------------------|------------------|------------------|------------------|------------------|
| <b>Energy source</b> (electricity, natural gas, oil, etc.)                |                  |                  |                  |                  |
| <b>Heating system type</b> (electric resistance, furnace, heat pump...)   |                  |                  |                  |                  |
| <b>Nominal capacity</b> (indicate the unit – kW, Mbtu/h...)               |                  |                  |                  |                  |
| <b>Heating system efficiency or COP</b>                                   |                  |                  |                  |                  |
| If any, changes in building <b>set points</b> (occ./ unocc. temp., % hum) |                  |                  |                  |                  |

#### Cooling Systems

*Please fill the table below for each cooling system at the site*

| Description                                                               | Cooling system 1 | Cooling system 2 | Cooling system 3 | Cooling system 4 |
|---------------------------------------------------------------------------|------------------|------------------|------------------|------------------|
| <b>Energy source</b> (electricity, natural gas, oil, etc.)                |                  |                  |                  |                  |
| <b>Cooling system type</b> (compressor, absorption...)                    |                  |                  |                  |                  |
| <b>Nominal capacity</b> (indicate the unit – kW, tons, etc.)              |                  |                  |                  |                  |
| <b>Cooling system SEER or COP</b>                                         |                  |                  |                  |                  |
| If any, changes in building <b>set points</b> (occ./ unocc. temp., % hum) |                  |                  |                  |                  |

### 4. Verified Energy Savings from M&V

**M&V Energy Savings (kWh/year)**

**M&V Demand Savings (kW/year)**

### 5. Additional Notes

## 6. Lighting System Assessment

Fill the next table with proper information on the baseline/new lighting systems installed. Use additional sheets if required. Identify emergency lights as separated lighting systems.

| # | Lighting System Name/Area | Baseline / new equip. | Lamp Type <sup>a</sup> | Nb. of Fixtures | Nb. of Lamps per Fixture | Nb. of Burnt Lamps | Wattage per Lamp (W) | Operating Hours (Schedule # or Other) <sup>b</sup> | Time of Use (Schedule # or Other) <sup>b</sup> | % of Lamps On during Annual Peak Period <sup>g</sup> | Type of Ballast <sup>c</sup> | Ballast Factor (if known) | Control Type <sup>d</sup> | Heating System (if any) | Cooling System (if any) |
|---|---------------------------|-----------------------|------------------------|-----------------|--------------------------|--------------------|----------------------|----------------------------------------------------|------------------------------------------------|------------------------------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|-------------------------|
| 1 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 2 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 3 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 4 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 5 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 6 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 7 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
| 8 |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |

| a- Lamp Type List: |                                                  |   |                                      |
|--------------------|--------------------------------------------------|---|--------------------------------------|
| a                  | CFL - Hard-wired                                 | m | Metal Halide - Pulse Start Fixture   |
| b                  | CFL - Screw-in                                   | n | Metal Halide - Reduced -Wattage Lamp |
| c                  | High-Pressure Sodium HID Lamp                    | o | Photoluminescent exit signs          |
| d                  | Induction Lamp Fixture                           | p | T5 High-Bay (High Output) Fixture    |
| e                  | Low-Pressure Sodium HID Lamp                     | q | T8 High-Bay (High Output) Fixture    |
| f                  | LED Screw-in/pin-based lamps/bulbs and downlight | r | T5 Std Energy Savings Fixture        |
| g                  | LED Strip Lights                                 | s | T8 Std Energy Savings Fixture        |
| h                  | LED Street lights/parking lights                 | t | T8 Super T8                          |
| i                  | LED Traffic/pedestrian signals                   | u |                                      |
| j                  | LED Exit Signs                                   | v |                                      |
| k                  | Metal Halide - Ceramic                           | w |                                      |
| l                  | Metal Halide - Electronic Ballast Fixture        | x | Other (specify)                      |

| b- Schedule List                                                    | d- Control Type - Choose 1 or more between: | e- Heating System  |
|---------------------------------------------------------------------|---------------------------------------------|--------------------|
| Schedule 1                                                          | Dimmers                                     | Heating system 1   |
| Schedule 2                                                          | Hand Switches                               | Heating system 2   |
| Schedule 3                                                          | Occupancy Sensors                           | Heating system 3   |
| Other (specify)                                                     | Photocells                                  | Heating system 4   |
| c- Type of Ballast                                                  | Time Switches                               |                    |
| E-Electronic                                                        | Other (specify)                             |                    |
| M-Electromagnetic                                                   |                                             |                    |
| g- Annual Peak Period                                               |                                             | f- Cooling Systems |
| From 17h to 19h, in Dec., Jan. & Feb., on non-holiday weekdays only |                                             | Cooling System 1   |
|                                                                     |                                             | Cooling System 2   |
|                                                                     |                                             | Cooling System 3   |
|                                                                     |                                             | Cooling System 4   |

## 6. Lighting System Assessment

Fill the next table with proper information on the baseline/new lighting systems installed. Use additional sheets if required. Identify emergency lights as separated lighting systems.

| # | Lighting System Name/Area | Baseline / new equip. | Lamp Type <sup>a</sup> | Nb. of Fixtures | Nb. of Lamps per Fixture | Nb. of Burnt Lamps | Wattage per Lamp (W) | Operating Hours (Schedule # or Other) <sup>b</sup> | Time of Use (Schedule # or Other) <sup>b</sup> | % of Lamps On during Annual Peak Period <sup>g</sup> | Type of Ballast <sup>c</sup> | Ballast Factor (if known) | Control Type <sup>d</sup> | Heating System (if any) | Cooling System (if any) |
|---|---------------------------|-----------------------|------------------------|-----------------|--------------------------|--------------------|----------------------|----------------------------------------------------|------------------------------------------------|------------------------------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|-------------------------|
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | Baseline              |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |
|   |                           | New                   |                        |                 |                          |                    |                      |                                                    |                                                |                                                      |                              |                           |                           |                         |                         |

| a- Lamp Type List: |                                                  |   |                                      |
|--------------------|--------------------------------------------------|---|--------------------------------------|
| a                  | CFL - Hard-wired                                 | m | Metal Halide - Pulse Start Fixture   |
| b                  | CFL - Screw-in                                   | n | Metal Halide - Reduced -Wattage Lamp |
| c                  | High-Pressure Sodium HID Lamp                    | o | Photoluminescent exit signs          |
| d                  | Induction Lamp Fixture                           | p | T5 High-Bay (High Output) Fixture    |
| e                  | Low-Pressure Sodium HID Lamp                     | q | T8 High-Bay (High Output) Fixture    |
| f                  | LED Screw-in/pin-based lamps/bulbs and downlight | r | T5 Std Energy Savings Fixture        |
| g                  | LED Strip Lights                                 | s | T8 Std Energy Savings Fixture        |
| h                  | LED Street lights/parking lights                 | t | T8 Super T8                          |
| i                  | LED Traffic/pedestrian signals                   | u |                                      |
| j                  | LED Exit Signs                                   | v |                                      |
| k                  | Metal Halide - Ceramic                           | w |                                      |
| l                  | Metal Halide - Electronic Ballast Fixture        | x | Other (specify)                      |

| b- Schedule List                                                    | d- Control Type - Choose 1 or more between: | e- Heating System  |
|---------------------------------------------------------------------|---------------------------------------------|--------------------|
| Schedule 1                                                          | Dimmers                                     | Heating system 1   |
| Schedule 2                                                          | Hand Switches                               | Heating system 2   |
| Schedule 3                                                          | Occupancy Sensors                           | Heating system 3   |
| Other (specify)                                                     | Photocells                                  | Heating system 4   |
| c- Type of Ballast                                                  | Time Switches                               |                    |
| E-Electronic                                                        | Other (specify)                             |                    |
| M-Electromagnetic                                                   |                                             |                    |
| g- Annual Peak Period                                               |                                             | f- Cooling Systems |
| From 17h to 19h, in Dec., Jan. & Feb., on non-holiday weekdays only |                                             | Cooling System 1   |
|                                                                     |                                             | Cooling System 2   |
|                                                                     |                                             | Cooling System 3   |
|                                                                     |                                             | Cooling System 4   |

## 0. Project Details

|                                      |       |                |       |
|--------------------------------------|-------|----------------|-------|
| Site Visit Date:                     | _____ | Contact Name:  | _____ |
| Project ID:                          | _____ | Contact Phone: | _____ |
| Project name:                        | _____ | Contact Email: | _____ |
| Company name:                        | _____ |                |       |
| Address:                             | _____ |                |       |
| List of people met during the visit: | _____ | _____          | _____ |
|                                      | _____ | _____          | _____ |

## 1. Section One: Design Process Strategies

### 1.1 Identify Design Intent

*Conduct a team meeting to identify key energy goals for the project and to coordinate subsequent efforts among team members.*

|       |                                                                                    |                                                             |        |
|-------|------------------------------------------------------------------------------------|-------------------------------------------------------------|--------|
| 1.1.1 | Did the project team conduct this meeting? Discuss...                              | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | Notes: |
| 1.1.2 | Collect a statement (if any) that the training was performed (minutes of meeting)? | <input type="checkbox"/> Check                              | Notes: |

### 1.2 Communicating Design Intent

*Develop key information about project performance requirements to insure that design goals are translated forward through the design process. Project goals are converted into documentation incorporated into each phase to guide design, sequence of operation, specifications, bid submittals, construction, acceptance testing and building operation.*

|       |                                                                                                                                                                                      |                                                             |        |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------|
| 1.2.1 | Did the project team clearly communicate the design intent? Discuss...                                                                                                               | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | Notes: |
| 1.2.2 | Ensure that the following documents exist: 1-Design Intent Meeting Summary, 2-Operational Performance Requirements, 3-Acceptance Testing Requirements, and 4-Construction Documents. | <input type="checkbox"/> Check                              | Notes: |
| 1.2.3 | Look at project documentation (specifications, bid submittals, etc.) to verify that project goals and performance requirements have been communicated through design process.        | <input type="checkbox"/> Check                              | Notes: |

### 1.3 Building Configuration

*Consider the implication of alternate building configurations to maximize building energy performance, functionality and daylighting. Identify the pros and cons of several alternate building configurations using existing analysis tools, consultants, reference material or other resources.*

|       |                                                                                                                                                        |                                |        |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|
| 1.3.1 | Verify that at least three alternate building configuration designs have been developed and analyze (could be included in the Design Intent Document). | <input type="checkbox"/> Check | Notes: |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|

### 1.4 Mechanical System Design

*Use project-specific load calculations based on Core Performance requirements including coincident load conditions to properly size mechanical equipment, rather than relying on generic rule-of-thumb sizing Criteria.*

|       |                                                                                                                                  |                                |        |
|-------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|
| 1.4.1 | Ensure that load calculations for sizing mechanical systems are compliant with ASHRAE Standard 55. Collect documentation if any. | <input type="checkbox"/> Check | Notes: |
| 1.4.2 | Discuss and ensure that documentation exists on the list of design process actions described in <b>Criteria 1.4</b> .            | <input type="checkbox"/> Check | Notes: |

| <b>1.5 Construction Certification (Acceptance Testing)</b>                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                               |                                |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| <i>Implement an Acceptance Testing protocol to test the operational characteristics of installed systems. Document that installed systems are operating as intended prior to occupancy. It is up to the project team to identify the key systems to be tested and verified to insure that the project meets the performance goals identified by the owner and design team. Specific guidance on test protocols are provided in Appendix A.</i> |                                                                                                                                               |                                |               |
| 1.5.1                                                                                                                                                                                                                                                                                                                                                                                                                                          | Review <b>Appendix A</b> of CPG and discuss how the acceptance testing requirements have been or will be met. Collect documentation (if any). | <input type="checkbox"/> Check | <b>Notes:</b> |

| <b>1.6 Operator Training and Documentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                              |                                                             |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------|
| <i>Collect a full set of construction documents and specifications, systems manuals, maintenance and calibration requirements, control protocols, etc. for use by the building operations team. Conduct an operator training session to make sure the building operators understand the systems and operation of the building. Information should be collected in a set of manuals designed to facilitate building operation and future communication of this information to new operating staff. Work with the building owner to identify the best way to collect, store and distribute this information.</i> |                                                                                                              |                                                             |               |
| 1.6.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Was the Operator Training given? Collect a statement (if any) that training was completed.                   | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | <b>Notes:</b> |
| 1.6.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Systems manual and full set of design and installation document available?                                   | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | <b>Notes:</b> |
| 1.6.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ensure that information of manuals describes building user interface with lighting, HVAC and temp. controls. | <input type="checkbox"/> Check                              | <b>Notes:</b> |

| <b>1.7 Performance Data Review</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                             |                                                             |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------|
| <i>Install digital utility meters capable of collecting hourly utility use data. Implement a data collection protocol on-site, with the local utility or a third party to collect this data. A summary of the information should be reviewed quarterly by building performance trends and identify potential system performance issues. Some building managers may choose to review this data more frequently to support ongoing operational improvements and maintenance.</i> |                                                                                                                                                                             |                                                             |               |
| 1.7.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ensure there is a protocol to collect and analyze energy use and building occupancy. Specific metering equipment must also be installed. Discuss and collect documentation. | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | <b>Notes:</b> |

|                          |  |  |  |
|--------------------------|--|--|--|
| <b>Additional Notes:</b> |  |  |  |
|                          |  |  |  |

## 2.1 Section Two: Core Performance Requirements

### 2.1 Energy Code Compliance

*In addition to implementing the requirements of the Core Performance program, projects using the program must meet all local energy code requirements of the prescriptive requirements of ASHRAE 90.1-2004 or the MNECB (1997), whichever is more stringent.*

|       |                                                                                                                                             |                                                             |               |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------|
| 2.1.1 | All buildings meet or exceed ASHRAE 90.1-2004 and MNECB 1997, and features not covered by CPG meet or exceed ASHRAE 90.1-2004 or IECC 2006. | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | <b>Notes:</b> |
| 2.1.2 | Provide a signed statement that mechanical equipment is compliant with ASHRAE 90.1-2004 and/or MNECB 1997.                                  | <input type="checkbox"/> Check                              | <b>Notes:</b> |

### 2.2 Air Barrier Performance

*During design and construction, develop and implement air sealing details and protocols to reduce uncontrolled air movement through the building envelope and duct systems.*

|       |                                                                                                                                                                                         |                                                             |               |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------|
| 2.2.1 | Ensure a full and continuous air barrier is installed, with attention to details at parapet, windows/doors and foundation connections. Provide documents.                               | <input type="checkbox"/> Check                              | <b>Notes:</b> |
| 2.2.2 | Interior separations: Is there an air barrier system between conditioned space and space designed to maintain air conditions (temp.+hum.) 50% different? If yes, provide documentation. | <input type="checkbox"/> Yes<br><input type="checkbox"/> No | <b>Notes:</b> |
| 2.2.3 | Provide specifications of air barrier materials, testifying compliance with ASTM E 2178 (air permeability < 0.004 cfm/ft <sup>2</sup> @ 0.3" of water).                                 | <input type="checkbox"/> Check                              | <b>Notes:</b> |

### 2.3 Minimum IAQ Performance

*Implement protocols to insure acceptable indoor air quality, including meeting or exceeding ASHRAE Standard 62-2001, developing and implementing air quality management plans for construction and operation, and conducting a building flush-out prior to occupancy.*

|       |                                                                                                                                           |                                |               |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| 2.3.1 | Ensure outdoor air control technique is compliant with ASHRAE Standard 62. Provide documentation.                                         | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.3.2 | Ensure the IAQ Construction Management Plan has been developed and implemented to control IAQ during construction. Provide documentation. | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.3.3 | Ensure the building has been flush with 100% of the scheduled quantity of outdoor air prior to occupancy. Provide flush-out plan.         | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.3.4 | Ensure the IAQ Operations Management Plan for building operation has been developed and implemented. Provide documentation.               | <input type="checkbox"/> Check | <b>Notes:</b> |

### 2.4 Opaque Envelope Performance

*Meet specific insulation Criteria for each building envelope assembly.*

|       |                                                                                                                                                                |                                |               |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| 2.4.1 | If window and glazed door area > 40%: Ensure all walls, roof assemblies, floor and slabs-on-grade meet Criteria of <b>Table 2.4.1</b> . Provide documentation. | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.4.2 | If window and glazed door area < 40%: Ensure energy performance modelling demonstration has been completed. Provide documents.                                 | <input type="checkbox"/> Check | <b>Notes:</b> |



| 2.5 Fenestration Performance                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                    |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| <i>Meet specific window performance Criteria for u-value and solar heat gain coefficient, based on CSA A440.2/NFRC ratings. Performance requirements are based on entire window assembly, not glazing alone.</i>                                                                                                 |                                                                                                                                                                                                    |                                              |
| 2.5.1                                                                                                                                                                                                                                                                                                            | If window and glazed door area > 40%: Ensure all vertical windows meet Criteria of <b>Table 2.5.1</b> . Provide documentation.                                                                     | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.5.2                                                                                                                                                                                                                                                                                                            | Ensure that skylight area is no greater than 5% of the roof area and that it meets Criteria of <b>Table 2.5.2</b> . Provide documentation.                                                         | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.5.3                                                                                                                                                                                                                                                                                                            | Ensure all fenestration (windows, skylights, doors) is rated according to Std. CSA A440.2 or the National Fenestration Council (NFRC).                                                             | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.6 Lighting Controls                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                    |                                              |
| <i>Install control systems throughout the building, including occupancy sensors and time clock controls. Daylit areas are encouraged to incorporate daylight controls, but at a minimum these areas must be provided with separate switching to facilitate future incorporation of daylight control systems.</i> |                                                                                                                                                                                                    |                                              |
| 2.6.1                                                                                                                                                                                                                                                                                                            | Ensure <b>all occupied areas</b> allow occupants to reduce illumination pattern by at least 50% (or 40% for HID lamps).                                                                            | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.6.2                                                                                                                                                                                                                                                                                                            | Ensure <b>all daylit areas</b> are separately controlled from non-daylit areas, with either automatic daylight controls or manual switching allowing 50% and 100% reduction of illumination level. | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.6.3                                                                                                                                                                                                                                                                                                            | Automatic controls: Occupancy sensors must be installed in almost all small public areas. Automatic turn-off after 30 minutes.                                                                     | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.6.4                                                                                                                                                                                                                                                                                                            | Automatic controls: Note if automatic daylight controls are installed (not mandatory).                                                                                                             | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.6.4                                                                                                                                                                                                                                                                                                            | Automatic controls: Note if time clock controls are installed in areas not requiring occupancy sensors (not mandatory).                                                                            | <input type="checkbox"/> Check <b>Notes:</b> |
| 2.7 Lighting Power Density (LPD)                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                    |                                              |
| <i>Projects may not exceed the lighting power density limits indicated in this Criterion.</i>                                                                                                                                                                                                                    |                                                                                                                                                                                                    |                                              |
| 2.6.1                                                                                                                                                                                                                                                                                                            | Ensure installed lighting equipment power density does not exceed the allowed lighting power density (LPD), as shown in <b>Table 2.7.1</b> . Provide documentation.                                | <input type="checkbox"/> Check <b>Notes:</b> |
| <b>Additional Notes:</b><br><div style="border: 1px solid black; height: 150px; width: 100%;"></div>                                                                                                                                                                                                             |                                                                                                                                                                                                    |                                              |

## 2.8 Mechanical Equipment Efficiency Requirements

*Mechanical equipment must meet the performance Criteria developed by the Consortium for Energy Efficiency (CEE) labeled as Tier 2 performance requirements.*

|       |                                                                                                                                                                                            |                                |               |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| 2.8.1 | Package unitary equipment must meet requirements of <b>Tables 2.8.1 and 2.8.2</b> and must be Energy Star labeled.                                                                         | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.2 | Gas Unit Heaters must have intermittent ignition device+power venting or flue damper. Gas Furnaces<66kW (225 kBtu/hr) have AFUE rating>90. Gas Furnaces in rooftop equipment have AFUE>80. | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.3 | Package Terminal AC and Heat Pumps must meet requirements of <b>Table 2.8.3</b> .                                                                                                          | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.4 | Boilers must meet requirements of <b>Table 2.8.4</b> .                                                                                                                                     | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.5 | Electric chillers must meet <b>Table 2.8.5</b> .                                                                                                                                           | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.6 | Absorption chillers must meet <b>Table 2.8.6</b> .                                                                                                                                         | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.8.7 | Equipment not listed above must meet Energy Star if applicable.                                                                                                                            | <input type="checkbox"/> Check | <b>Notes:</b> |

## 2.9 Dedicated Mechanical Systems

*Spaces in the building with specific process loads or that require conditioning significantly different for the main building spaces must be provided with a separate, dedicated mechanical system designed specifically for these loads.*

|       |                                                                                                                       |                                |               |
|-------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| 2.9.1 | Zones with special temperature/humidity requirements should be served by separate air distribution systems.           | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.9.2 | Areas with significantly different load profiles than main building should be served by a separate, dedicated system. | <input type="checkbox"/> Check | <b>Notes:</b> |

## 2.10 Demand Control Ventilation

*Outside airflow should be controlled by a system which measures CO2 and provides airflow based on occupant density, as measured by the CO2 sensor.*

|        |                                                                                                                                                             |                                |               |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| 2.10.1 | Demand Control Ventilation must be installed, controlled by CO2 sensors. Ensure that CO2 sensors are installed.                                             | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.10.2 | When cooling by economizer is required, air damper control must respond to economize settings rather than CO2 sensors.                                      | <input type="checkbox"/> Check | <b>Notes:</b> |
| 2.10.2 | CO2 settings: Increase ventilation at 800 ppm, maximum ventilation at 950 ppm. Differential settings: max differential between outside and inside: 530 ppm. | <input type="checkbox"/> Check | <b>Notes:</b> |

**Additional Notes:**



|                                                  |  |  |
|--------------------------------------------------|--|--|
| <b>2.11 Domestic Hot Water System Efficiency</b> |  |  |
|--------------------------------------------------|--|--|

|                                                                                                                             |  |  |
|-----------------------------------------------------------------------------------------------------------------------------|--|--|
| <i>Domestic hot water demand should be met by either demand hot water heaters or high-efficiency condensing appliances.</i> |  |  |
|-----------------------------------------------------------------------------------------------------------------------------|--|--|

|        |                                                                                                                                                       |                                |        |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|
| 2.11.1 | Domestic hot water loads: served by gas demand hot water heating systems, high efficiency tank water heaters, or sealed combustion hot water heaters. | <input type="checkbox"/> Check | Notes: |
| 2.11.1 | High efficiency tank water heating systems: should include RSI-2.5 (R-14) tank insulation, and heat traps to prevent thermosiphoning.                 | <input type="checkbox"/> Check | Notes: |
| 2.11.1 | Fossil-fuel fired systems that have not sealed combustion should include flue control damper.                                                         | <input type="checkbox"/> Check | Notes: |
| 2.11.3 | Verify that water conserving aerators and shower heads are installed in lavatories and staff areas.                                                   | <input type="checkbox"/> Check | Notes: |

|                                                |  |  |
|------------------------------------------------|--|--|
| <b>2.12 Fundamental Economizer Performance</b> |  |  |
|------------------------------------------------|--|--|

|                                                                                                                                                |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <i>This Criterion includes a list of features and performance verification strategies to insure proper and effective economizer operation.</i> |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

|        |                                                                                        |                                |        |
|--------|----------------------------------------------------------------------------------------|--------------------------------|--------|
| 2.12.1 | Installed economizers should incorporate features as of <b>Criteria 2.12.</b>          | <input type="checkbox"/> Check | Notes: |
| 2.12.1 | Verify that all units larger than 33,000 Btu/hr (9.7 kW) have an economizer installed. | <input type="checkbox"/> Check | Notes: |

|                           |  |  |
|---------------------------|--|--|
| <b>2.13 Heat Recovery</b> |  |  |
|---------------------------|--|--|

|                                                                                                                                                              |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <i>Incorporate a heat recovery system in the ventilation air exhaust stream for spaces with high occupancy or high outdoor air ventilation requirements.</i> |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

|        |                                                                                                                                                                                                      |                                |        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|
| 2.13.1 | Energy recovery ventilation system should be installed and should include latent heat recovery with effectiveness of min. 70%. If any, air-air sensible heat recovery systems must be 50% efficient. | <input type="checkbox"/> Check | Notes: |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|

|                                                |  |  |
|------------------------------------------------|--|--|
| <b>2.14 Supply Air Temperature Reset (VAV)</b> |  |  |
|------------------------------------------------|--|--|

|                                                                                                                                                         |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <i>VAV systems should include control capabilities to reset supply air temperature to the warmest setting that will meet cooling load in all zones.</i> |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

|        |                                                                                                                              |                                |        |
|--------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|
| 2.14.1 | In shoulder and cool weather seasons, VAV control strategy must use the warmest setting that meet cooling load in all zones. | <input type="checkbox"/> Check | Notes: |
|--------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------|

|                          |  |
|--------------------------|--|
| <b>Additional Notes:</b> |  |
|--------------------------|--|

# **SMALL BUSINESS ENERGY SOLUTIONS PROGRAM**

**IMPACT AND PROCESS EVALUATION 2011**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **EXECUTIVE SUMMARY**

This report presents the results of the 2011 process and impact evaluation of the Small Business Energy Solutions (SBES) program. The 2011 evaluation was based on in-depth interviews with the Program Manager (PM), three delivery agents, three electricians and one contractor as well as on 15 on-site visits and a telephone survey of 61 program participants.

## **PROGRAM OVERVIEW**

The SBES program provides direct installation of energy-efficient lighting retrofits to small businesses such as retail stores, restaurants, lodgings, convenience stores, grocery stores and small offices as well as to small government, institutional and health care facilities.

In 2011, the following lighting measures were installed in participating businesses:

- > a variety of compact fluorescent lamps (CFLs), including hard glass, twist, mini-twist, dimmable, cold cathode and specialty CFLs;
- > light-emitting diode (LED) exit signs;
- > T-8 and T-5 fluorescents, with a focus on high-performance products, including high-output T8 and T5 systems;
- > efficient halogen MR16, PAR30 and PAR38 lamps;
- > exterior lighting upgrades such as high-pressure sodium and metal halides; and
- > lighting controls such as occupancy sensors.

Participating businesses pay as little as 20 percent of the installation and material costs whereas ENSC covers the remaining amount of up to 80 percent. Under specific conditions, eligible facilities can choose to finance their portion of program costs, repaid through their Nova Scotia Power (NSPI) bill for up to a 24-month period at 0 percent interest.

Delivery agents (DAs) are important actors in program success as they are responsible for all aspects related to the marketing, administration, ordering, delivery and installation of the materials as well as to the proper recycling of old materials. Therefore, they are required to have experienced staff members who can fulfill such responsibilities.

In 2011, several aspects of the SBES program were modified and upgraded. First, the DAs could choose to order and buy their materials from any vendor they wished. This change resolved the issue of delays in the shipping of materials and created more competitive prices and services. Furthermore, since the program is now offered across the province, the need for additional recycling and disposal services has been fulfilled and the DAs' concerns about this issue have also been addressed. Also, new lighting controls, such as occupancy sensors, have been added to the list of products in order to enhance energy savings by lowering the hours of operation. Finally, ENSC developed a participant process flow chart in 2011 in order to make the program participation procedures clearer.



The program aimed to achieve net electricity savings of 18.48 GWh and demand savings of 4.27 MW in 2011.

## **KEY FINDINGS**

The 2011 evaluation of the SBES program demonstrated that the program is well designed and that its participant base keeps growing from one year to the next. The program totalled 1,468 participants for the year 2011, which is a substantial increase compared to last year (801 participants). In terms of net energy savings, the program generated 23.176 GWh, which represents a considerable increase in comparison to 2010 net savings (11.21 GWh).

### **Satisfaction**

Satisfaction towards the program is very high among participants. Indeed, most participants expressed their satisfaction with the overall program and most of its aspects. However, two program components obtained significantly lower satisfaction ratings compared with 2010 findings and should therefore be closely monitored: the paperwork and procedures required to receive incentives and the assistance provided for program application.

Participants were also asked to express their satisfaction with regard to various aspects of the lighting equipment that had been installed through the program. Even though their level of satisfaction is very high, it is somewhat lower compared to last year's evaluation. It is to be noted that changes were made to the program in 2011. Notably, delivery agents could order material from any vendor they wished. There is no saying that those changes caused this drop in satisfaction; however, Econoler still recommends closely monitoring this program aspect.

Participants mentioned recommendations to improve the program that mainly relied on communication; e.g., increasing marketing and advertising, providing more information and improving interactions with program representatives. Participants declared that most of the information received about the program had been obtained by word of mouth. Had it not been for the latter, they would never have heard about the program or been informed about the different program components. The program partners interviewed do agree that program marketing and advertising need to be improved. They believe that more people would know about the program if efforts were streamlined in that manner.

The recommendations expressed by program partners and participants to improve overall communication need to be observed closely considering the fact that more changes will be made to the program in 2012. Indeed, ENSC is planning on including measures other than lighting to the program.

## Program Energy Savings

To calculate the net savings of the SBES program in 2011, Econoler reviewed the gross savings estimated by ENSC by adjusting the unitary savings values used in the tracking sheet and included interactive effects for all products. Moreover, Econoler took into consideration the free-ridership and internal spillover measured through the participant survey. Using this approach, a free-ridership level of 12.8 percent was captured, while a spillover level of 0.8 percent was identified.

**Table 1: Distortion Effects and Net-to-Gross Ratio**

|                      | <b>2011</b> |
|----------------------|-------------|
| Free-Ridership Level | 12.8%       |
| Spillover Level      | 0.8%        |
| Net-to-Gross Ratio   | 0.88        |

The evaluation revealed that the SBES program had generated net energy savings of 23.176 GWh and demand savings of 6.820 MW at the generator in 2011.

**Table 2: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | <b>Initial Gross Savings</b> | <b>Installed Gross Savings</b> | <b>Installed Gross Savings with Interactive Effects</b> | <b>NTGR</b> | <b>Net Savings</b> |
|---------------------------|------------------------------|--------------------------------|---------------------------------------------------------|-------------|--------------------|
| <b>Energy Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 28.978 GWh                   | 28.978 GWh                     | 28.978 GWh                                              | 0.90        | 26.080 GWh         |
| <b>Evaluation Results</b> | <b>28.426 GWh</b>            | <b>28.426 GWh</b>              | <b>26.336 GWh</b>                                       | <b>0.88</b> | <b>23.176 GWh</b>  |
| <b>Demand Savings</b>     |                              |                                |                                                         |             |                    |
| Tracked Savings from ENSC | 8.536* MW                    | 8.536 MW                       | 8.536 MW                                                | 0.90        | 7.682 MW           |
| <b>Evaluation Results</b> | <b>8.373 MW</b>              | <b>8.373 MW</b>                | <b>7.750 MW</b>                                         | <b>0.88</b> | <b>6.820 MW</b>    |

\* Tracked demand savings from ENSC were calculated based on the tracking sheet received and on an estimate for the "Rise" project.

The net energy savings values calculated were compared to the program tracked savings for 2011. The values calculated were slightly lower than the values tracked. This can be explained by the

interactive effects factor calculated for the lighting products installed in non-refrigerated spaces. This factor resulted in a 7.7 percent reduction of gross savings. Moreover, the NTGR calculated for the evaluation was slightly lower than the value used for tracked savings.

## **RECOMMENDATIONS**

Econoler finds that the program works well overall and at a satisfactory level. In addition to general recommendations presented for all ENSC programs in the overall executive summary of the 2011 demand-side management (DSM) programs, the Evaluator has the following specific recommendations that aim at optimizing specific aspects of the program:

- SBES-R1. Improve the tracking sheet to allow for a better validation of savings:** Currently, the tracking sheet does not detail the components comprised in each measure, including the installation of occupancy sensors and the unitary wattage value used for savings calculations. Accounting for these details would allow the Evaluator to differentiate two measures with similar equipment but different key components (like ballasts) and to validate savings calculations. Moreover, wattage values that were found to be incorrect during the evaluation should be modified in the Demand Side Management Data System. Correcting these values will ensure that uniform wattage values are used for savings calculations.
- SBES-R2. Enhance marketing and advertising to increase program awareness:** In spite of their high level of satisfaction with regard to the program, participants' recommendations to improve the program mainly relied on communication. Program participants wish to see more marketing and advertising, more interaction with program representatives and more information on the program. Moreover, most participants mentioned having learned about the program by word of mouth only; otherwise, they would not have known about the program or any of its components. The program partners interviewed did agree also that improvements need to be made to program marketing and advertising as a share of customers who could be aware of the program are not. To that effect, they suggested creating a mailing list to promote the program in its designated area. They also recommended targeting landlords and property management companies in large city areas to open opportunities in larger non-residential buildings. Overall, participants as well as program partners agree that broader marketing efforts should be deployed to increase program awareness.
- SBES-R3. Require additional information during survey campaigns with commercial and industrial (C&I) customers as well as from participants to better estimate the interactive effects factor and increase the number of on-site visits conducted:** Collecting information on the heating source and on the use of air conditioning from each participant of the SBES program and during C&I survey campaigns would provide a better evaluation of the interactive effects factor and of net program savings.

Moreover, the number of sites should be increased. This would allow installing data loggers to monitor lighting hours of operation at more sites and obtaining a more reliable self-declaration ratio. Increasing the number of on-site visits would also allow calculating more reliable installation ratios.

- SBES-R4. Revise the list of products eligible for an incentive through the SBES program:** Restricting eligibility to high-end products like LED lamps or high-performance T8 lighting systems that business owners would not likely install on their own could help reduce the free-ridership level obtained for the program. Currently, the program includes several products that are already very common, and that facility managers might install on their own. Keeping these products in the program yields higher free-ridership levels.

# **1 PROGRAM DESCRIPTION**

## **1.1 PROGRAM DESCRIPTION AND BACKGROUND**

The Small Business Energy Solutions (SBES) program provides the direct installation of energy efficient lighting retrofits to eligible businesses in Nova Scotia. The eligible businesses pay as little as 20 percent of the installation and materials costs, and the remaining portion, up to 80 percent, is paid by ENSC. Under specific conditions, participants can finance their portion of the costs on their Nova Scotia Power (NSPI) bill for up to a 24-month period at 0 percent interest. If participants do not use financing from NSPI, they pay their portion of the project cost before any materials are shipped.

For the purposes of this program, “small businesses” are defined as any non-residential participant with an average monthly peak demand of less than 100 KW and a total annual electricity use of less than 300,000 kWh. It includes small industrial facilities, small commercial businesses such as retail stores, restaurants and lodgings, convenience and grocery stores, small offices or small government, institutional and health care facilities.

In 2008, the initial implementation of the program covered two geographical areas, namely the city of Dartmouth and Pictou County, and it expanded over time until it was offered to the whole province as of January 1, 2010.

The program is executed through delivery agents (DAs). Although fixed material prices were secured for the DAs through a tender with electrical equipment suppliers in the initial program implementation, referred to as “material vendors”, this was modified in 2010 so the DAs could choose the vendor of their choice for better prices and services while providing a fixed price that included materials and installation. A similar approach is used through a tendered price from a recycling and disposal company referred to as the “recycling vendor”. These expansions of suppliers became necessary to address materials supply and delivery issues reported by the DAs in 2009 and 2010.

The DAs are required to have adequate staffing, including an experienced project manager; qualified marketing, sales and administration staff; qualified electrical/lighting auditing staff and qualified electricians. In 2011, the province was divided into six (6) designated areas, with a DA assigned to each one.

The DAs are responsible for all aspects related to the marketing, administration, ordering, delivery and installation of the materials, as well as proper recycling of old materials.

The program includes the inspection of a number of completed projects. If necessary, the amount paid by ENSC is adjusted according to the information validated during on-site visits.

## **Program Objectives**

As a resource acquisition program, the goals of this program are:

- > To overcome an important program barrier related to concerns on the part of small businesses that efficient lighting might decrease their lighting quality;
- > To overcome barriers to participation that include knowledge of potential savings, access to contractors, access to capital, access to recycling services and lack of time to manage installations;
- > To promote efficient lighting products among small businesses; and
- > To eventually transform the market by raising the efficiency of standard practices.

Through these goals, the program aimed to achieve net electricity savings of 18.48 GWh and demand savings of 4.27 MW in 2011. The SBES program generated net electricity savings of 11.21 GWh in 2010, 4.70 GWh in 2009 and 1.52 GWh in 2008.

## **Eligible Measures**

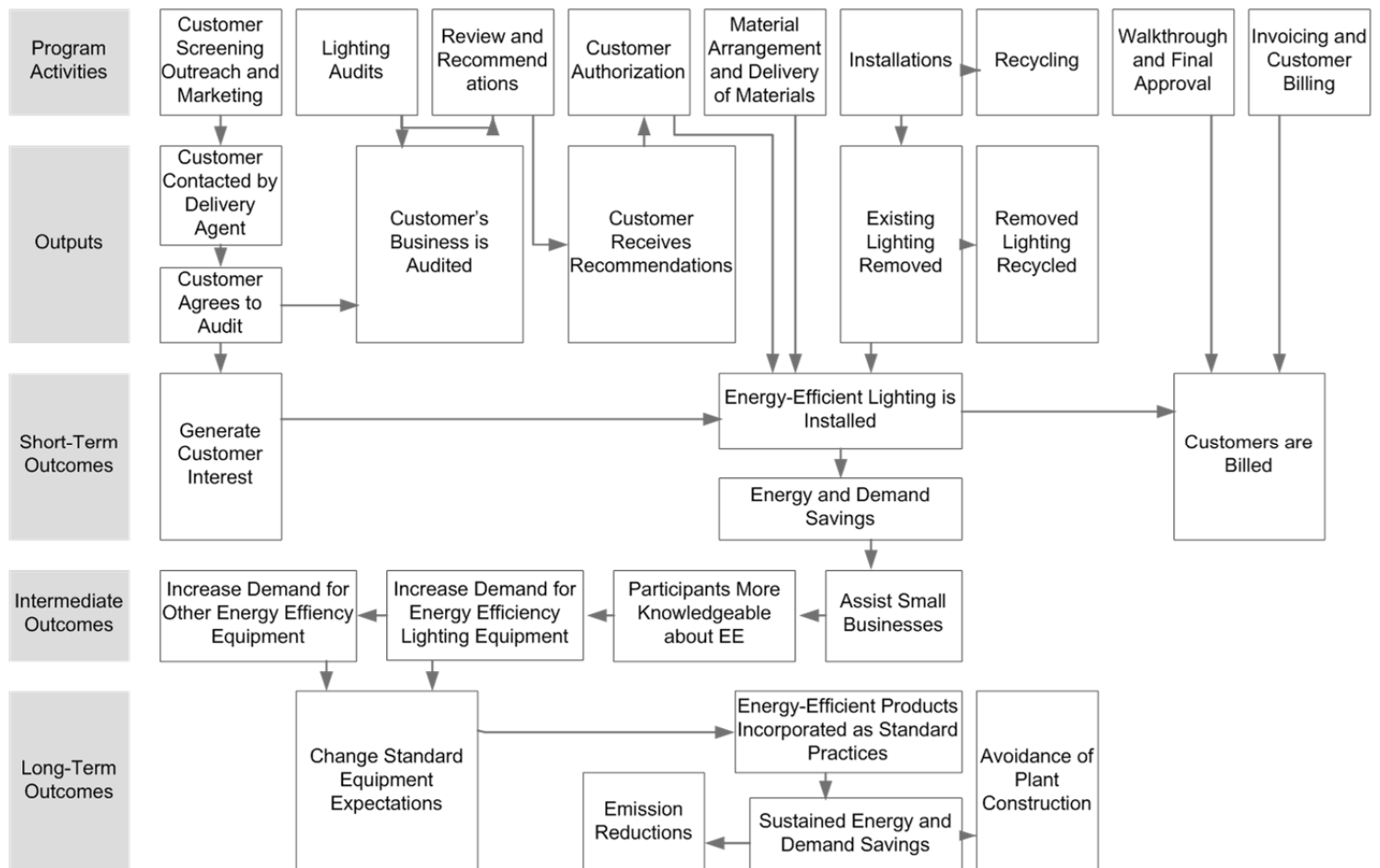
The promoted measures in 2011 were the following:

- > A variety of CFLs including hard glass, twist, mini-twist, dimmable or cold cathode, as well as specialty CFLs;
- > LED Exit signs;
- > T-8 and T-5 fluorescents, with a focus on high-performance products, including high-output T8 and T5 systems;
- > Efficient halogen MR16, PAR30, and PAR38 lamps;
- > Exterior lighting upgrades such as high pressure sodium and metal halide;
- > Lighting controls such as occupancy sensors.

## 1.2 PROGRAM LOGIC MODEL

The program logic model below shows the causal links between program activities and the changes expected in the market.

**Figure 1: Small Business Energy Solutions Program Logic Model<sup>1</sup>**



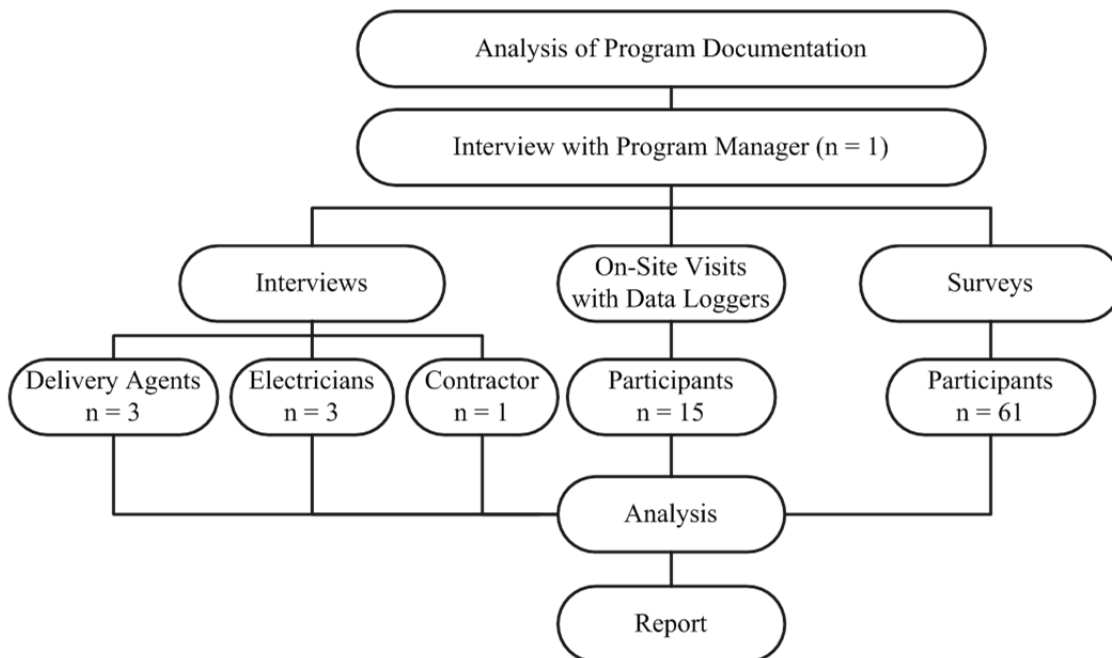
<sup>1</sup> The program logic model included in the 2010 evaluation has been modified in order to move the “energy and demand savings” from the intermediate outcome to the short-term outcome.

## 2 METHODOLOGY

### 2.1 METHODOLOGICAL MODEL

Figure 2 below illustrates the research strategy used for the 2011 evaluation and features the collection tools used. Copies of the interview guides and the survey questionnaire are included in Appendices III, IV, V, VI and VII.

**Figure 2: Methodological Model**



### 2.2 METHODOLOGY DESCRIPTION

#### 2.2.1 Analyzing Existing Program Information

The first task in the process evaluation of the SBES program was the analysis of all program documentation. At this stage, all available program information was reviewed.

The information used to conduct this analysis was primarily obtained from the following four sources:

- > ENSC website;



- > 2010 evaluation report;
- > program manual;
- > tracking sheet.

### **2.2.2 In-Depth Interview with Program Manager**

Econoler conducted one interview in September with the Program Manager (PM) and covered a variety of program-related topics. The following elements were examined during the interview with the PM:

- > program justification and theory;
- > calculation of gross and net savings;
- > program barriers;
- > program marketing and outreach strategy;
- > participation forms and flow charts;
- > role of the program partners; and
- > prior evaluation recommendations.

Based on the results of the PM interview, the list of questions and topics to include in the program partners' interviews for the process evaluation was finalized.

### **2.2.3 In-Depth Interviews with Program Partners**

In September, in-depth interviews were conducted with three program delivery agents, three program electricians and one program contractor. These interviews were intended, among other things, to understand the partners' involvement with the program, their participation process in the program and their perception and level of satisfaction with the program.

### **2.2.4 On-Site Visits**

In October and November, 15 on-site visits were conducted at facilities in which SBES measures had been implemented. They were conducted by Econoler's subcontractor, Equilibrium Engineering. These site visits were used to validate the implementation of measures in accordance with the data found in the tracking sheet, including the number of units of equipment installed, the technology used, and their hours of operation. The pre-and post-installation hours of operation, as well as the pre-installation existing equipment hours of operation were validated by interviewing the business owners. The post-installation hours of operation were also confirmed by metering selected areas in each facility.

The methodology used for the on-site visits for the SBES program is further explained in the program impact evaluation section of this report. A copy of the site visit protocol is included in Appendix VIII.

### 2.2.5 Participant Survey

A telephone survey with a total of 61 program participants was conducted by Econoler's subcontractor, Corporate Research Associates, Inc. (CRA), from its offices in Halifax, NS. The interviews were conducted in October utilizing computer-assisted telephone interviewing (CATI). The average length of the survey was 19 minutes.

The participant survey was used to gain a better understanding of the following program features:

- > previous program participation;
- > how participants learned about the program;
- > participant motivations and barriers;
- > energy attitudes;
- > spillover and free-ridership;
- > satisfaction with the program; and
- > future intentions.

The profile of the organizations interviewed through the survey is featured in Appendix II. The following table shows the population and sample size as well as the associated sampling error at the 90 percent confidence level for the 2008, 2009, 2010 and 2011 telephone surveys.

**Table 3: Sample Size and Sampling Error**

| Survey            | Population | Sample Size (n) | Sampling Error at 90% Confidence Interval |
|-------------------|------------|-----------------|-------------------------------------------|
| 2008 Participants | 93         | 50              | ±8.0%                                     |
| 2009 Participants | 214        | 50              | ±10.2%                                    |
| 2010 Participants | 801        | 65              | ±9.8%                                     |
| 2011 Participants | 1,468      | 61              | ±10.4%                                    |

### 3 PROCESS EVALUATION

#### 3.1 OBJECTIVE AND APPROACH OF THE PROCESS EVALUATION

The process evaluation conducted under the SBES program focuses on one of ENSC's evaluation objectives, which is "assessing the effectiveness of the program design and delivery." With this objective in mind, the process evaluation was customized to focus on how to enhance program performance.

This process evaluation was performed through interviews with the PM and with the DAs, as well as through a telephone survey of program participants.

#### 3.2 PROGRAM MANUAL CONTENT

The SBES program features a manual that contains a series of components for internal use by program staff. It is an essential tool for all program staff as well as for the Evaluator. There is no perfect example of program manual content. Indeed, it is usually custom-designed to meet an organization's specific needs. However, some specific components are usually included in program manuals intended for internal use. The following table presents such information as well as what is presented in the SBES manual.

**Table 4: Program Manual Content**

| Program Manual Content                                                                                       | SBES Program Manual |
|--------------------------------------------------------------------------------------------------------------|---------------------|
| Document revisions                                                                                           | ✓                   |
| Program description (including nature or type of program)                                                    | ✓                   |
| Program justification                                                                                        | ⊘                   |
| Program objectives                                                                                           | ✓                   |
| Incentives                                                                                                   | ✓                   |
| Eligibility criteria                                                                                         | ✓                   |
| Program partners and their roles                                                                             | ✓                   |
| Program barriers                                                                                             | ⊘                   |
| Total savings objectives (with details of gross savings and hypothesis for free-ridership and other effects) | ⊘                   |
| Details about the savings calculations and type of measures                                                  | ⊘                   |
| Budget per year                                                                                              | ✓                   |
| Cost-effectiveness test results                                                                              | ✓                   |

| Program Manual Content                                                                                                                                                                                                                                                                                                                                                     | SBES Program Manual |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Market study or technical study that supports program elements or assumptions                                                                                                                                                                                                                                                                                              | ⊘                   |
| Marketing plan                                                                                                                                                                                                                                                                                                                                                             | ✓                   |
| Evaluation plan                                                                                                                                                                                                                                                                                                                                                            | ⊘                   |
| Program theory                                                                                                                                                                                                                                                                                                                                                             | ⊘                   |
| Logic model                                                                                                                                                                                                                                                                                                                                                                | ⊘                   |
| Program process flow chart                                                                                                                                                                                                                                                                                                                                                 | ✓                   |
| Partner or participant process flow chart                                                                                                                                                                                                                                                                                                                                  | ✓                   |
| Program forms                                                                                                                                                                                                                                                                                                                                                              | ✓                   |
|  Information included in the program manual<br> Information partially included in the program manual<br> No information |                     |

Econoler analyzed the SBES program manual. It contains relevant information useful for both the PM and the Evaluator. Notably, the specific parties' responsibilities regarding program delivery as well as the subtleties surrounding eligibility criteria and the associated discretion extended to the PM are very well documented. Moreover, all information related to the administration and management of the program for the PM and the different forms necessary for administrative purposes are included and very clear.

However, the program manual is missing important information making the understanding of the program design and delivery difficult. Some information concerns minor issues that are easily manageable (the first three following comments address them), while others are more substantial. The following are recommendations to supplement and improve the tool:

- > **Document the major characteristics of the program:** The goal of the program and its objectives in terms of energy or demand savings, as well as the measures promoted by the program and their deemed savings should be included in the program manual. Furthermore, the justification for setting the financing mechanism up to 80 percent should be documented in the program manual in order to understand the rationale for this level of incentive.
- > **Include all relevant information.** Section 2.4 of the program manual regarding participant payments mentions that municipal utility customers are not eligible for financing or lump sum payments and are required to pay their share before the shipping of materials. There is no mention of the possibility for these customers to create an account with NSPI to specifically finance the 20 percent portion. This option should be specified in the program manual, as it is available to municipal utility customers.

- 
- > **Remain consistent throughout the program manual with parties' names or terminology:** In the program flow chart, the term "labor vendor" is actually used to identify the DA. Econoler recommends always using the same terminology to avoid confusion.
  - > **Provide a "base case":** The program manual does not provide a "base case" that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.
  - > **Provide the parameters used to estimate the program objectives:** After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results.
  - > **Make explicit plans for post-installation inspections:** The criteria or basis for selecting projects to be inspected should be explained in the program manual. Also a standard inspection report could be designed and used as a performance indicator for management and evaluation purposes.
  - > **Complete the program manual to keep track of changes and standardize the content:** The content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects. Additionally, the program manual should include important information and changes to serve as "program memory" in case of modifications or staff changes. Moreover, the program manual content should be continually updated. The following are two examples of required updates for the SBES program manual:
    - The marketing name of the program has changed from "Small Business Lighting Solutions" to "Small Business Energy Solutions," to better reflect the nature of the program. The titles in Attachments B, D, E and F in the program manual should be changed to reflect the actual program name.
    - In order to resolve material quality and delivery delays as well as recycling and disposal issues, the DAs can now purchase qualified products from any vendors they choose instead of using a sole source material vendor under contract with ENSC. These modifications to the program are sound solutions and the section regarding the contractual relationships in the program manual (section 8) should be modified in accordance with these changes.

### **3.3 PROGRAM TRACKING SHEET**

Econoler reviewed the content of ENSC's tracking sheet for the SBES program. This tracking sheet is an extract from the online Demand Side Management Data System (DSMDS).

In general, the tracking sheet is useful to the PM and provides a way to continuously monitor program activities. It includes the most necessary fields for program administration. However, the system does not provide sufficient information on each measure to allow the PM to identify the exact measure installed or to validate how the savings were calculated. For example, for the SBLS T12 Fluorescent category, several wattage values can be found for equipment having the same name. This is the result of equipment having different ballast factors. However, this difference is not reflected in the name of the existing equipment. This also prevents the validation of the savings calculation, as part of the evaluation process. Moreover, the system does not provide any information on the use of lighting control measures like occupancy sensors. However, only approximately one percent of the lighting measures in this program include occupancy sensors. Moreover, some fields, like the proposed hours of operation, are not filled in the tracking sheet, even though that piece of information is available for every project. Finally, not only does the tracking sheet include projects that have been implemented (closed status), it also features measures that have not been implemented and, in some instances, that have been cancelled.

The tracking sheet presents information on two separate sheets: one lists customer information and the other details on measures. Each project has a unique identification number that links customer information with the details on the measures implemented for that project. The details on measures include information on the number of units and type of equipment that exist and are installed, and on the hours of operation for a particular measure. All the customer information necessary to conduct field activities (surveys and on-site visits) is included on the customer tracking sheet. However, some fields on the measures sheet are not systematically filled in. This information might not be essential for the program administration but would be useful for its evaluation.

The type and number of units of equipment as well as the hours of operation of the old and new equipment are filled in by the delivery agent, based on the information collected on site and on the equipment selected for replacement. The hours of operation are based on information provided by participants while the wattage values are established by ENSC based on data from industry sources such as the National Center for Appropriate Technology. However, those unitary wattage values are not presented in the tracking sheet despite the fact that they are used in ENSC's Demand-Side Management Data System. For measures with a reduction in hours of operation, the projected hours of operation are also based on information provided by participants during the installation of a measure.

Demand and energy savings on the measures tracking sheet are calculated as follows:

$$\begin{aligned}
 & \text{Demand savings [kW]} = \\
 & \frac{\text{Old system wattage [W]} \times \text{Number of old systems installed}}{1000 \left[ \frac{\text{W}}{\text{kW}} \right]} \\
 & - \\
 & \frac{\text{New system wattage [W]} \times \text{Number of new systems installed}}{1000 \left[ \frac{\text{W}}{\text{kW}} \right]} \\
 & \\
 & \text{Annual energy savings} \left[ \frac{\text{kWh}}{\text{year}} \right] \\
 & = \\
 & \frac{\text{Old system wattage [W]} \times \text{Old hours of operation} \left[ \frac{\text{h}}{\text{year}} \right] \times \text{Number of systems installed}}{1000 \left[ \frac{\text{Wh}}{\text{kWh}} \right]} \\
 & - \\
 & \frac{\text{New system wattage [W]} \times \text{New hours of operation} \left[ \frac{\text{h}}{\text{year}} \right] \times \text{Number of systems installed}}{1000 \left[ \frac{\text{Wh}}{\text{kWh}} \right]}
 \end{aligned}$$

For lamp replacements, the savings are calculated based on the wattage difference between the baseline lamps and the new lamps installed, as well as on the number of units installed for the measure. The hours of operation are not directly available in the tracking sheet but can be calculated with the information on demand and energy savings available in the database. However, for measures without occupancy sensors, the baseline hours of operation and the replacement hours of operation are the same. Thus, the calculation of the replacement hours of operation is not required.

For the implementation of T8 and T5 fluorescent lighting fixture or lamp and ballast replacements, wattage savings calculations for lamp and ballast replacements as well as for fixture and lamp replacements are established by the PM using prescriptive values for baseline and new equipment. Based on the prescriptive wattage value, demand savings and annual energy savings are calculated for each measure. Hours of operation values and the number of systems replaced are also obtained from information provided by the participant and the DA for each site. When no occupancy sensor measure is implemented with a lighting measure, the baseline hours of operation and the hours of operation of new equipment are the same.

The program tracking sheet was also evaluated by the PM during the interview. The PM is satisfied with the tracking sheet and considers it easy to use.

In conclusion, several adjustments must be made in the future to allow the validation of savings calculations, improve tracking sheet consistency and facilitate program evaluation. The Evaluator recommends that ENSC:

- > **Present the detailed characteristics of each measure and the corresponding unitary savings to allow for savings calculation validation by the Evaluator:** The tracking sheet, in its current state, does not detail the components included in each measure and the unitary wattage value used for savings calculation. The information available on the tracking sheet does not allow the Evaluator to differentiate two measures with similar equipment but different key components like ballasts. However, those components have a great impact on unitary wattage values. Moreover, the absence of a unitary wattage value corresponding to a specific type of equipment does not make it possible for the Evaluator to validate the savings calculation.
- > **Identify measures with lighting controls:** Currently, the measures tracking sheet does not indicate the installation of lighting control devices, nor does it provide information on the reduction of hours of operation. This does not allow the Evaluator to identify such measures or to calculate the additional savings associated with them. The PM should develop a mechanism to allow for the identification of those measures.
- > **Determine the required fields and remove the unnecessary ones:** The PM together with the Evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered in these fields. Conversely, the fields that are not used should be removed from the tracking sheet in order to focus on useful data.
- > **Make sure that all fields are systematically filled in:** Once the necessary fields are identified, it is recommended that the PM ensure they are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered on the tracking sheet. At the time of the analysis of the 2011 tracking sheet, the following fields included a significant number of missing values:
  - Building type: indicating the type of building where the measure is implemented. This field was empty in 48 percent of the records.
  - Bill account number: used to match a customer's financial and consent forms. This field was empty in 2 percent of the records.
  - Proposed hours of operation: used to calculate the energy savings. This field was empty in all the records.

For future evaluations, those elements will be useful for field activities and will facilitate the savings validation.



- > **Set limitations for entries and develop a validation process:** To ensure that incorrect values are not entered in the tracking sheet, a validation process should be developed by ENSC. This will ensure that values such as hours of operation will not exceed a defined range or that inconsistent postal codes are not entered in the database. Occurrences of these two inconsistencies were encountered in the database. The validation process could also be used to identify missing entries.

### **3.4 PROGRAM DESIGN AND IMPLEMENTATION**

In 2011, several aspects of the SBES program were modified and upgraded. First, there are now multiple material vendors from which DAs may choose to order and buy their materials. This change has resolved the issue regarding delays in the shipping of materials and more competitive prices and services since the DAs have expressed a high level of satisfaction with partners and suppliers. By the same token, since the program is now offered throughout the province, the need for additional recycling and disposal services has been fulfilled and the DAs' concerns about this issue have also been resolved. Secondly, new lighting controls, such as occupancy sensors, have been added to the program in order to enhance energy savings by lowering the hours of operation. The addition of new measures to the program without affecting other programs will generate additional savings. Finally, ENSC developed a participant process flow chart in 2011 in order to make the program participation procedures clearer.

ENSC is planning to change the program considerably in 2012 by including measures other than lighting. Given that most DAs are electric lighting contractors or electrical contractors, the Evaluator recommends that ENSC consider replacing them with organizations that are more familiar with energy efficiency programs and, therefore, not limited to one particular specialization. In that situation, the DAs would better understand the nature of the interventions conducted under any energy efficiency programs and be in a good position to promote all products eventually covered by the program.

The Evaluator noticed that the SBES program has no evaluation plan. Econoler strongly recommends that, for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than during the evaluation stage as the latter can take place several months later. This will result in a more rigorous evaluation and will guarantee that specific topics important to the PM are covered. The two most important components of the plan are the evaluation methodology as well as the pre- and post-data required to apply the selected methodology.

In summary, Econoler has the following recommendations to improve design and implementation of the SBES program:

- > Consider replacing current DAs with organizations not limited to lighting specialization.
- > Develop an evaluation plan in parallel with program design and development.

### **3.5 ENSC WEBSITE**

Customers can consult the ENSC website to find relevant information regarding the SBES program, such as the percentage of energy savings they could achieve with different lighting solutions, the criteria for eligibility, the costs and financing options, the process for enrolling in the program and the program contacts. The website also provides the program brochures, which address questions frequently asked by business owners (Saving money now and later: How does it work? How much does it cost?) plus a testimonial of the lighting quality achieved through an efficient lighting upgrade. The participation process flow chart developed by ENSC in late 2011 could be made available on the website.

### **3.6 RELATIONSHIP WITH PARTNERS**

According to the partners interviewed (DAs and electricians), the transition of responsibilities from Nova Scotia Power (NSPI) to ENSC did not cause any confusion in the market, except for minor delays and adjustments.

The partners state that the implementation process of the SBES program is easy and that all mid-course modifications were easily adapted to the way they do business. The recent changes related to material vendors and the name of the program are well perceived by the partners. Indeed, choosing their material provider has been a positive experience by the DAs and the new program name is very positive since the program will be expanded to address more than lighting.

Satisfaction regarding the relationship between partners and ENSC personnel is excellent. Sub-contractors mentioned the high level of satisfaction of participants. Although the partners' satisfaction level regarding the overall program is very high, the program scope and boundaries need to be better streamlined. The following are recommendations from partners to adjust the targets and components of the program:

- > **Create a mailing list:** One DA suggests creating a mailing list to promote the program since many customers are not aware of the program in his designated area. He also suggests that landlords and property management companies need to be targeted in large city areas to open opportunities in larger non-residential buildings.
- > **Accept faxed contracts:** One DA suggests accepting faxed contracts as opposed to originals to improve performance. ENSC could also develop a web-based contract as opposed to paperwork.

- > **Streamline eligibility and financing procedures:** One DA recommends streamlining eligibility and financing procedures to improve program participation and delivery. This comment needs to be assessed in context with the fact that the program does not target chains operating multiple franchise operations. This could be reviewed since there is a multiplication potential factor that could generate significant savings. If the franchises are considered as small businesses and the program selects a few representative facilities to implement measures that prove to be cost effective, other stores could follow.

## 3.7 PARTICIPANT PERSPECTIVES

### 3.7.1 Previous Program Participation

One in 10 respondents (11%) participated in other NSPI or ENSC energy efficiency programs prior to participating in the SBES program.

From the seven respondents who participated in previous NSPI or ENSC programs, three reported participating in one NSPI lighting program (without providing more detail as to the specific program).

**Table 5: Previous Program Participation**

| <b>Other Program Participation</b> | <b>2011</b> |
|------------------------------------|-------------|
| <i>Sample Size</i>                 | <i>61</i>   |
| Yes                                | 11%         |
| No                                 | 87%         |
| Don't know                         | 2%          |
| <b>Name of Other Programs</b>      | <b>2011</b> |
| <i>Sample Size</i>                 | <i>7</i>    |
| NSPI Lighting Program              | 3           |
| Other                              | 4           |

### 3.7.2 Program Awareness

Respondents to the participant survey were asked how they had become aware of the SBES program. One half (51%) mentioned word of mouth (friend or business associate), while one-third (34%) cited ENSC staff. Three in 10 (30%) heard about the program through other or previous participants. The high level of word of mouth (friend, business associate, other or previous participants) is a strong indicator of program satisfaction and also suggests that the program has built momentum after the initial years of operation.

**Table 6: Source of Awareness of SBES Program**

| Source of Awareness                          | 2008 | 2009 | 2010 | 2011* |
|----------------------------------------------|------|------|------|-------|
| <i>Sample Size</i>                           | 50   | 50   | 65   | 61    |
| Friend or business associate (word of mouth) | 42%  | 22%  | 23%  | 51%   |
| NSPI/ENSC staff/presentation                 | 2    | 16   | 18   | 34    |
| Another/previous participant                 | 4    | 2    | 5    | 30    |
| Contractor or vendor                         | 12   | 32   | 14   | 28    |
| SBES literature received through mail        | 6    | 2    | 5    | 28    |
| NSPI/ENSC website                            | 4    | 2    | 9    | 11    |
| Phone call from SBES/ENSC representative     | 14   | 4    | 5    | 10    |
| Newspaper/media                              | 6    | 2    | 3    | 3     |
| NSPI/ENSC bill insert                        | --   | 2    | --   | 3     |
| Electrician                                  | --   | --   | 8    | --    |
| Landlord                                     | --   | --   | 2    | --    |
| In-person visit by SBES representative       | 10   | 8    | --   | --    |
| NSPI/ENSC (unspecified mode of contact)      | --   | 2    | --   | --    |
| NSPI/ENSC e-mail                             | --   | 2    | --   | --    |
| Don't know                                   | --   | --   | 9    | --    |
| Other                                        | --   | 2    | --   | 3     |
| *Multiple mentions <sup>2</sup>              |      |      |      |       |

<sup>2</sup> In assessing the source of program awareness, participants had historically been allowed to indicate only one response, representing the source of first contact with the program. In 2011, the survey changed to allow multiple responses in order to appraise sources of contact that might have occurred simultaneously.

### 3.7.3 Participant Motivations and Barriers

When asked about their reasons for participating in the SBES program, the majority of the 2011 respondents (89%) reported saving on energy costs/bills as a primary or secondary motivation, with three-quarters (74%) citing this as their primary motivation. This finding is consistent with previous results in 2010, 2009 and 2008. Improving existing lighting conditions was the second most frequently mentioned motivation, mentioned by three in 10 respondents as a primary (13%) or secondary (16%) motivation (Table 7).

The program should continue to promote the financial benefit of participating in the SBES program since savings on energy cost is the main participation reason.

**Table 7: Reasons for Participating**

| Motivations                              | 2008                      |                                  | 2009                      |                                  | 2010                      |                                  | 2011                      |                                  |
|------------------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|---------------------------|----------------------------------|
|                                          | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation | Most Important Motivation | Second Most Important Motivation |
| <i>Sample Size</i>                       | 50                        | 50                               | 50                        | 50                               | 65                        | 65                               | 61                        | 61                               |
| Save on energy costs/bills               | 70%                       | 27%                              | 76%                       | 22%                              | 71%                       | 18%                              | 74%                       | 15%                              |
| Improve existing lighting conditions     | 6                         | 31                               | 10                        | 26                               | 14                        | 25                               | 13                        | 16                               |
| Take advantage of program incentives     | 2                         | 8                                | 6                         | 4                                | 5                         | 8                                | 7                         | 21                               |
| Protect the environment                  | 4                         | 6                                | 4                         | 14                               | 3                         | 12                               | 2                         | 7                                |
| Energy efficiency                        | --                        | --                               | 2                         | 2                                | --                        | 2                                | 2                         | 7                                |
| To improve building                      | --                        | --                               | --                        | --                               | --                        | --                               | --                        | 5                                |
| Reduce maintenance costs                 | --                        | 2                                | 2                         | 8                                | 8                         | 6                                | --                        | 5                                |
| Reduce carbon footprint                  | --                        | 4                                | --                        | 4                                | --                        | 8                                | --                        | 3                                |
| Upgrade old lighting                     | 16                        | 11                               | --                        | --                               | --                        | 2                                | --                        | --                               |
| Already changing lights                  | 2                         | --                               | --                        | --                               | --                        | --                               | --                        | --                               |
| Get experts to do audit and installation | --                        | --                               | --                        | 2                                | --                        | --                               | --                        | --                               |
| Replace non-working equipment            | --                        | 2                                | --                        | --                               | --                        | 3                                | --                        | --                               |
| To increase resale value                 | --                        | 2                                | --                        | --                               | --                        | --                               | --                        | --                               |
| Other                                    | --                        | --                               | --                        | --                               | --                        | --                               | 3                         | 5                                |
| Don't know                               | --                        | 6                                | --                        | 18                               | --                        | 17                               | --                        | 11                               |

Again this year, the majority of the respondents (77%) reported facing no barriers to participating in the SBES program, although two in 10 did report experiencing barriers to their participation (Table 8).

Of the 12 respondents who reported there were barriers to participating in the SBES program, the length of the process was identified as the most important barrier by three respondents, followed by a lack of contact with program representatives by two respondents.

**Table 8: Barriers to Program Participation**

| <b>Any Barriers</b> | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>  | 50          | 50          | 65          | 61          |
| No                  | 88%         | 90%         | 88%         | 77%         |
| Yes                 | 10          | 10          | 12          | 20          |
| Don't know          | 2           | --          | --          | 3           |

Seven in 10 2011 respondents (69%) reported that they owned their own buildings. Respondents who reported that they did not own their buildings were asked if they had needed to get permission from the building owner to participate in the program and, if so, how significant a barrier it had been for them to obtain that permission. Only three of the 19 renters (16%) reported that they needed to obtain permission from the building owner in order to participate in the SBES program (Table 9). Of the three respondents who needed to obtain permission from the building owner, no one reported that it had been a significant barrier.

**Table 9: Building Ownership Status and Need for Owner Permission**

| <b>Ownership Status</b>            | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>                 | 50          | 50          | 65          | 61          |
| Own                                | 78%         | 74%         | 74%         | 69%         |
| Lease                              | 22          | 26          | 25          | 31          |
| Don't know                         | --          | --          | 2           | --          |
| <b>Owner's Permission Required</b> | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
| <i>Sample Size</i>                 | 11          | 13          | 16          | 19          |
| Yes                                | 18%         | 31%         | 38%         | 16%         |
| No                                 | 82          | 69          | 56          | 84          |
| Don't know                         | --          | --          | 6           | --          |

### 3.7.4 Energy Attitudes

Nearly all of the 2011 respondents reported that reducing energy usage (95%) and managing energy costs (93%) were important for their businesses.

**Table 10: Importance of Energy Management**

| <b>Importance of Energy Management*</b>                                                               | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>                                                                                    | 50          | 50          | 65          | 61          |
| Reducing energy usage                                                                                 | 96%         | 94%         | 98%         | 95%         |
| Managing energy costs                                                                                 | 94%         | 96%         | 96%         | 93%         |
| * Those giving a rating of 5 or 4 on a scale where 5= "very important" and 1 = "not at all important" |             |             |             |             |

### 3.7.5 Prior Purchases

A small majority (62%) of the 2011 respondents reported purchasing energy-efficient lighting products prior to participating in the SBES program. Among the 2011 respondents who had previously purchased energy efficient lighting products, seven out of 10 (71%) reported having purchased CFLs and just under one-half (47%) reported retrofitting T-12 lighting with T8s or T5s, which represents an increase from 2010 findings. One-quarter purchased LED Exit lights (26%), also an increase from 2010 findings.

**Table 11: Prior Purchases of Efficient Lighting Products**

| <b>Previously Purchased Products</b> | <b>2008</b>              | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|--------------------------------------|--------------------------|-------------|-------------|-------------|
| <i>Sample Size</i>                   | 50                       | 50          | 65          | 61          |
| Yes                                  | 56%                      | 42%         | 54%         | 62%         |
| <b>Type of Purchases</b>             | <b>Multiple Response</b> |             |             |             |
| <i>Sample Size</i>                   | 28                       | 21          | 45          | 38          |
| CFLs                                 | 57%                      | 62%         | 71%         | 71%         |
| T-12s retrofit to T8s or T5s         | 36                       | 33          | 20          | 47          |
| LED Exit lights                      | 7                        | 5           | 11          | 26          |
| Metal halide or high pressure sodium | 4                        | --          | --          | 16          |
| Motion sensors                       | 4                        | --          | 3           | --          |
| Electronic ballasts                  | 4                        | --          | --          | --          |
| Other                                | --                       | --          | 9           | 5           |
| Don't know                           | 4                        | 5           | 3           | --          |

### 3.7.6 Program Influence

Financial assistance from ENSC is the most important factor that influenced organizations' decisions to implement energy-efficient lighting measures (a mean of 8.9 on an importance scale from 0 to 10). Specifically, both financial assistance from ENSC (mean of 8.9) and funding of the lighting audit by ENSC (mean of 7.6) are considered extremely significant factors, followed by information received during the initial contact by a program representative (mean of 7.4). Recycling and removal of lamps and fixtures, a program activity, has also influenced decisions to implement energy-efficient lighting measures (mean of 7.2).

**Table 12: Influence of Program Elements on SBES Participation**

| <b>Program Elements</b><br>0 is "not at all important", 10 is "extremely important"            | <b>2011<br/>Mean Score</b> |
|------------------------------------------------------------------------------------------------|----------------------------|
| <i>Sample Size</i>                                                                             | 61                         |
| ENSC financial assistance                                                                      | 8.9                        |
| ENSC funded lighting audit                                                                     | 7.6                        |
| Information received during the initial contact by a program representative                    | 7.4                        |
| Recycling of removed lamps and fixtures                                                        | 7.2                        |
| Existing energy efficiency code                                                                | 5.4                        |
| Company's or organization's corporate policy or guidelines regarding the purchase of equipment | 5.2                        |
| Standard practice in your industry                                                             | 4.3                        |
| Previous experience with the SBES program, or a similar program either from ENSC or NSP        | 3.4                        |

### 3.7.7 Future Energy Efficiency Actions

The large majority of the 2011 respondents (93%) reported they would be likely to purchase energy-efficient equipment when replacing equipment in the future. This result indicates positive attitudes of participants towards energy efficiency.

**Table 13: Likelihood of Purchasing Energy-Efficient Products in the Future**

| <b>Future Energy Efficiency Actions</b> | <i>Sample Size</i> | <b>Rating: 5 = "very likely" and 1 = "not at all likely"</b> |          |          |          |          |           |
|-----------------------------------------|--------------------|--------------------------------------------------------------|----------|----------|----------|----------|-----------|
|                                         |                    | <b>5</b>                                                     | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>DK</b> |
| <b>2008</b>                             | 50                 | 78%                                                          | 20       | --       | --       | 2        | --        |
| <b>2009</b>                             | 50                 | 64%                                                          | 28       | 6        | 2        | --       | 3         |
| <b>2010</b>                             | 65                 | 77%                                                          | 22       | 2        | --       | --       | 1         |
| <b>2011</b>                             | 61                 | 70%                                                          | 23       | 5        | --       | --       | 2         |



### 3.7.8 Satisfaction with the Program

The vast majority of 2011 respondents (87%) reported a rating of 5 or 4 on a 5-point scale, where 5 is “very satisfied” and 1 is “not at all satisfied,” when assessing the overall program. This represents a statistically significant drop compared with 2010 findings at a 90 percent confidence level. Despite lower satisfaction with the overall program, more than three-quarters (78%) reported that they were “very satisfied” with the overall program and no respondent gave a score lower than 3. Respondents were also asked their level of satisfaction with specific aspects of the program. At least eight out of 10 respondents reported that they were “satisfied” with each aspect, which is very good. Noteworthy is that the paperwork and procedures required to receive the incentives and assistance as part of program application decreased significantly compared with 2010 findings. Consequently, forms to fill out and assistance given to do so could receive special attention. With respect to the fact that completion of the project on schedule received the lowest score, although it is comparable to last year’s results, this aspect should also receive special attention.

**Table 14: Satisfaction with the SBES Program**

| <b>Satisfaction with SBES Program*</b>                            | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|-------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size**</i>                                              | <i>50</i>   | <i>50</i>   | <i>65</i>   | <i>61</i>   |
| <b>Overall program</b>                                            | <b>100%</b> | <b>94%</b>  | <b>97%</b>  | <b>87%</b>  |
| Capabilities of installers or contractors doing installation work | --          | --          | --          | 96%         |
| Audit technician                                                  | 93%         | 99%         | 90%         | 93%         |
| Rebate/Incentive amount                                           | 96%         | 93%         | 98%         | 92%         |
| Installation process                                              | 87%         | 92%         | 94%         | 91%         |
| Quality of audit recommendations                                  | 96%         | 91%         | 92%         | 91%         |
| Quality of vendors who provided recommendations                   | 98%         | 94%         | 92%         | 90%         |
| On-site lighting audit                                            | 98%         | 93%         | 95%         | 88%         |
| Scheduling and timing of installation                             | 86%         | 94%         | 86%         | 88%         |
| Audit cost and savings analysis                                   | 93%         | 85%         | 96%         | 88%         |
| Initial contact with contractors                                  | 93%         | 96%         | 82%         | 87%         |
| Interaction/communication with contractors                        | 94%         | 94%         | 87%         | 87%         |
| Delivery agent (single point of contact)                          | 94%         | 98%         | 91%         | 86%         |
| Paperwork and procedures required to receive incentives           | 98%         | 98%         | 95%         | 86%         |
| Assistance with program application                               | 98%         | 98%         | 94%         | 85%         |
| Completion of the project on schedule                             | 87%         | 90%         | 84%         | 84%         |
| *% very satisfied / satisfied                                     |             |             |             |             |
| ** Don't know/refused removed from calculations                   |             |             |             |             |

The respondents were asked to rate their satisfaction with various aspects of the lighting equipment that had been installed through the SBES program. The vast majority of participants (80% or greater) reported that they were satisfied with the different aspects of the lighting equipment installed through the program. Nevertheless, four different aspects were scored significantly lower than last year: i.e., the flickering of the products installed, the measure lifespan, the light quality and the energy savings. The drop in satisfaction with the latter aspects combined with the recent change with respect to the selection of the material vendor in 2011 raise a potential issue regarding the quality of products. There is no saying that the change caused such drop in satisfaction; however, Econoler still recommends closely monitoring this program aspect.

**Table 15: Satisfaction with Lighting Equipment**

| <b>Satisfaction with Lighting Equipment*</b>                                                            | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size**</i>                                                                                    | 50          | 50          | 65          | 61          |
| Brightness of lighting                                                                                  | 93%         | 96%         | 97%         | 96%         |
| Time required for lights to come on                                                                     | 93%         | 98%         | 93%         | 91%         |
| Flickering                                                                                              | 86%         | 91%         | 98%         | 90%         |
| Measure lifespan                                                                                        | 95%         | 94%         | 97%         | 87%         |
| Light quality                                                                                           | 88%         | 98%         | 99%         | 86%         |
| Energy savings                                                                                          | 95%         | 82%         | 94%         | 80%         |
| * Those giving a rating of 5 or 4 on a scale where 5 = "very satisfied" and 1 = "not at all satisfied". |             |             |             |             |
| **dk/na removed from calculations.                                                                      |             |             |             |             |

### 3.7.9 Participants Recommendations for Improvements

Increasing advertising/marketing (18%), providing more information to reduce confusion (11%) and improving interactions with program representatives (7%) were the most suggested improvements to the SBES program. Accelerating the process was also suggested by five percent of respondents. Over half of the 2011 respondents could not provide an improvement suggestion.

The following are participant comments that illustrate the main recommendations expressed:

- > "Program marketing and promotion should be improved. I only heard of it through word of mouth otherwise I wouldn't have known about the rebate."
- > "I had found that the audit results were hard to understand for someone who is not an electrician."
- > "I would say the difficulties in the initial [contact] are in the communication once you get past the application process, it was very little."
- > "The only issue I have is the time it is taking. Initial contact was back in the spring, it is now six months late and we are still in limbo as to whether or not we have been approved. Communication could be better."

Noteworthy is that the program partners interviewed also mentioned that improvements needed to be made to program marketing and advertising as a number of customers who could be aware of the program were not.

**Table 16: Suggested Improvements to the SBES Program**

| <b>Suggestions</b>                               | <b>2011</b> |
|--------------------------------------------------|-------------|
| <i>Sample Size</i>                               | <i>61</i>   |
| Increase advertising/marketing                   | 18%         |
| More information/Found process confusing         | 11%         |
| Better communication/Hard to get in contact with | 7%          |
| Quicker process                                  | 5%          |
| Satisfied with program                           | 5%          |
| Other                                            | 10%         |
| Don't know                                       | 52%         |

Over half of the 2011 respondents (59%) would have found a diagram illustrating the steps of the SBES program helpful in facilitating their participation in the program, with one in four indicating it would have had significantly facilitated their participation.

This result indicates that the participation process flow chart developed by ENSC in late 2011 was a good initiative as it will potentially simplify the involvement of future program participants.

**Table 17: Provision of a Diagram Illustrating Steps of SBES Program**

| <b>Diagram Illustrating Steps of SBES Program Would have Facilitated Participation</b> | <b>2011</b> |
|----------------------------------------------------------------------------------------|-------------|
| <i>Sample Size</i>                                                                     | <i>61</i>   |
| Significantly                                                                          | 23%         |
| Somewhat                                                                               | 36%         |
| Slightly                                                                               | 8%          |
| Not at all                                                                             | 18%         |
| Depends on what the figure or illustration would have been                             | 2%          |
| Don't know                                                                             | 13%         |

## **4 IMPACT EVALUATION**

### **4.1 OBJECTIVE AND APPROACH OF THE IMPACT EVALUATION**

The impact evaluation is aimed at determining the gross and net savings of the program for 2011. Both energy and demand savings were considered in this evaluation. To do so, the following parameters were analyzed by Econoler:

- > unitary wattage of the lighting products;
- > hours of operation;
- > installation rate;
- > diversity factor;
- > interactive effects;
- > free-ridership; and
- > internal spillover.

The impact evaluation was based on a review of the program tracking sheet, 15 on-site visits with time-of-use metering and a telephone survey of 61 participants.

The review of the program tracking sheet included an analysis of the unitary wattage for each measure and an assessment of how the savings were calculated for each measure. The on-site visits were used to verify the type of technology installed in participant facilities, as well as to collect information on the hours of operation based on self-declaration and lighting loggers installed for one week in selected areas of the facilities. Information on the space heating source and heating, ventilation and air conditioning (HVAC) equipment installed at each site selected was also obtained during the on-site visits. The data collected on-site was not used to adjust savings, except to calculate the interactive effects factor and the diversity factor. Moreover, the information collected was very useful to identify opportunities for improvement in future years. The gross energy savings evaluation is the result of these two activities.

The participant survey provided information to calculate the net-to-gross ratio (NTGR) for this program, including free-ridership and internal spillover. The NTGR established was used to calculate the program net savings.

### 4.1.1 On-Site Visit Sampling and Protocol

#### Sampling Methodology

The sampling was established based on the participant list in the tracking sheet, which included 1,468 entries for completed projects in 2011. Of these projects, 405 were implemented during the first half of the year and were tracked using a now retired database. Detailed information on old and new measures and on demand savings was retrieved for 373 of the 405 “Rise” jobs and was integrated into the rest of the measures completed for 2011.

In order to consider projects in all ranges of savings, and to cover the main measures implemented, projects were sorted by status, total energy savings and new equipment. This made it possible to identify the extent to which the savings in each category of old equipment was accounted for within the program. For the sampling, a minimum quota of at least one project for the five major categories of measures was set, which represented 97.4 percent of program savings. The weight in terms of savings for each category is presented in the following table and the percentage of total savings for each of the five categories selected is underlined. This table includes all savings values, except for the 32 “Rise” jobs for which detailed information could not be retrieved.

**Table 18: Total Energy Savings for Each Category of Existing Equipment**

|                     | Category of Existing Equipment |              |             |                      |               |                |               |               |                |       |            |
|---------------------|--------------------------------|--------------|-------------|----------------------|---------------|----------------|---------------|---------------|----------------|-------|------------|
|                     | CFLs                           | Exit Signs   | Halogen PAR | High-Pressure Sodium | Incand.       | Mercury Vapour | Metal Halide  | T12 Fluor.    | T5 High-Output | T8    | T8 Decomm. |
| Total Savings (MWh) | 7.4                            | 371.3        | 81.5        | 552.9                | 4,740.1       | 93.4           | 3,135.2       | 15,567.2      | 11.5           | 469.4 | 158.7      |
| % of Total Savings  | 0.03%                          | <u>1.48%</u> | 0.33%       | <u>2.21%</u>         | <u>18.94%</u> | 0.37%          | <u>12.53%</u> | <u>62.19%</u> | 0.05%          | 1.24% | 0.63       |

A list of preferable regions, close to major city centres, was established for site visit selection. The following areas were considered:

- > Halifax;
- > Dartmouth;
- > Cape Breton area.

However, in one case, the location was outside of the desired zones. That participant was one of the few large sites available for an on-site visit and was selected nonetheless.

Based on the analysis and criteria defined above, 12 sites with energy savings of up to 100,000 kWh and three sites with energy savings of above 100,000 kWh were selected. For each site, the category of old equipment that was replaced was examined to ensure that the selection covered at least the five largest categories of existing equipment listed in the table (T12 Fluorescent, Incandescent, Metal Halide, High-Pressure Sodium, Exit Signs). As only one category was not represented in the initial sample, a random selection for that category was performed to complete the final sample. Moreover, the site locations were validated to ensure that no site was located more than 50 km away from one of the major urban centres selected except in the case mentioned above, for which another site was selected. It should be noted that the project status was also validated in order to select only projects that were completed (*closed status*) for the on-site visits. The sample for site selection included two samples of 15 sites, allowing for duplication in case on-site visits could not be scheduled for some sites in the first sample. For large duplicate sites, the selection included sites located outside of the desired zones.

Finally, it is to be noted that the 15 on-site visits covered installations conducted by the three DAs involved in the program in equal proportions.

## **On-Site Visit Protocol**

An on-site visit protocol listing the information to be collected for each site was developed. For each site, information on the type, number and wattage of old and new products installed was collected. Furthermore, information on heating/cooling equipment and usage was also collected. In addition, the hours of operation were collected for each facility visited.

Time-of-use loggers were installed on several lights to collect information on lighting hours of operation for a complete week. For most sites, lighting time-of-use was monitored for each section of the facility where a measure was implemented. However, a few sites had numerous sections with implemented measures, which did not allow the installation of loggers in each of them. A maximum of 11 loggers were installed at each site and the location of their installation was selected based on the type of measure installed in each section and its similarity to other sections, the objective being to monitor time-of-use for as many measures as possible and for sections as diverse as possible.

The detailed on-site visit protocol is presented in Appendix VIII.

## **4.2 GROSS SAVINGS**

The gross savings evaluation was computed based on the information available in the program tracking sheet as well as on the data collected during the on-site visit activity and the savings review.

For 2011, a total of 17,378 closed measures were identified, based on the information in the tracking sheet and collected for most of the “Rise” jobs. The allocation of gross savings to different categories

was established based on the information collected. For “Rise” jobs for which this information was not available, savings were allocated to each category of measures using the proportion of total savings corresponding to each category. This approach allowed for savings adjustments to be applied to measures implemented under the “Rise” project, thus providing a conservative estimate of gross savings. Moreover, total demand savings for the “Rise” project were estimated based on the total demand savings obtained for all other measures in the tracking sheet.

#### **4.2.1 Unitary Wattage**

A unitary wattage values review was conducted for each category of measures identified for the program. Three types of replacements can be conducted through this program:

- > Lamp replacements;
- > Fixture and lamp replacements; and
- > Lamp and ballast replacements.

Occupancy sensors can also be installed in combination with a lighting measure. For this measure, the energy impact is quantified as a reduction in pre-retrofit hours of operation and is directly incorporated in every measure implemented.

For each type of old or new equipment, the unitary wattage consumption is established based on the characteristics of each component of the system. For lamps, standard lamp wattage is used. For fluorescent lighting systems, the unitary wattage is a combination of ballast characteristics and lamp wattage.

The information in the tracking sheet provided by ENSC does not include the unitary wattage of each lighting system removed or installed; neither does it provide detailed information on the system that could allow the Evaluator to determine a standard wattage for each system. Therefore, it is not possible to validate the savings calculations in the tracking sheet.

In order to validate unitary wattage values, the little information available in the tracking sheet was used to re-engineer how the savings were calculated and to find a number of details about the different systems encountered. This re-engineering of the savings calculation showed that, in some instances, multiple unitary wattage values were used for a given measure. While this is understandable for fluorescent lighting measures, it is not acceptable for simple lamp replacements. For example, for HPS Flood 70 W lamps, unitary wattages of 70 W and 95 W were used, depending on the project investigated. These wattages were compared to the project information available from the online Demand Side Management Data System. Since the correct unitary wattage value for this system is 95 W, the wattage for measures with a unitary wattage of 70 W must be corrected. The same calculation analysis was performed for all measures.

Sources like the Consortium for Energy Efficiency (CEE) and Efficiency Vermont<sup>3</sup> were used to validate unitary wattage from prescriptive measures. When the difference between the two values was substantial, the wattage obtained from those sources was used to calculate the energy savings instead of the prescriptive wattage provided by ENSC. The Evaluator recommends that the PM correct the wattage values that are deemed incorrect in the Demand-Side Management Data System, thereby eliminating any inconsistencies.

Finally, the prescriptive wattage values for each fluorescent measure were established by ENSC using data from the National Center for Appropriate Technology. However, spot watt metering activities were conducted for two types of fluorescent T8 fixtures in 2008. These activities revealed that wattage values for new T8-2LAMP-4FOOT-28W and T8-4LAMP-4FOOT-28W systems were higher than the values used in the tracking sheet, resulting in a reduction of savings for these systems in previous evaluations. However, no indication on spot watt metering activities being conducted for old systems was present in the previous reports. In order to be able to use the wattage adjustments obtained for these two T8 systems, metering activities on the old equipment replaced to collect measured data for these systems as well would have been required, ideally using the same metering equipment. That way, metered values could be used to calculate final savings and any uncertainty regarding metering errors would be eliminated. Since metered values for old equipment were not available, the wattage adjustment applied to T8 systems in previous evaluations was not applied for the 2011 evaluation.

Table 19 presents the systems where an adjustment to wattage values was found to be necessary.

**Table 19: Systems where Wattage Adjustment is Necessary**

| Type of Measure | System                       | Tracking sheet – Unitary Wattage | Evaluation Results – Adjusted Unitary Wattage |
|-----------------|------------------------------|----------------------------------|-----------------------------------------------|
| New CFLs        | HPS flood 70 W lamps (old)   | 70 W and 95 W                    | 95 W                                          |
| New CFLs        | Mercury vapour – 175 W (old) | 193 W and 205 W                  | 205 W                                         |
| New CFLs        | Mercury vapour – 250 W (old) | 275 W and 290 W                  | 290 W                                         |

Based on the systems presented above, for which adjustments are required, the following percentage adjustments were determined to establish the gross savings:

<sup>3</sup>Efficiency Vermont, Technical Reference User Manual (TRM): *Measure Savings Algorithms and Cost Assumptions* (December 2008).



- > For CFL measures, a total increase of 0.06 percent in energy savings and of 0.04 percent in demand savings. These values are the combination of unitary wattage adjustments for HPS flood-70 W, mercury vapour-175 W and mercury vapour-250 W lamps. They were applied to the final CFL savings values.

#### **4.2.2 Hours of Operation**

Currently, the hours of operation in the program tracking sheet are obtained through information provided by participants. During the on-site visits, the hours of operation for the lighting systems were recorded using time-of-use loggers. A total of 90 loggers were installed at 15 sites, allowing hours of operation to be collected for several sections of each facility where an on-site visit was conducted. It is to be noted that the on-site visits were conducted mainly for quality assurance. The number of on-site visits scheduled was not established based on the number of participants, but rather based on the information available from the previous evaluation.

Following the on-site visits, the hours of operation collected by the loggers were compared to the values declared by the participant to establish a self-declaration ratio for each measure. A weighted average of these ratios was used to establish a self-declaration ratio of 83.33 percent for the program. This self-declaration ratio would result in a reduction of 16.67 percent of energy savings. However, the error margin for the self-declaration is 15.72 percent, with a 90 percent level of confidence. This error margin is almost as high as the energy savings reduction that would be applied based on the self-declaration ratio. Based on this element, the self-declaration ratio was not used to adjust the energy savings. However, it is an indication that the hours of operation need to be further investigated in future evaluations. The Evaluator recommends increasing the number of sites where data loggers are installed in order to obtain a more reliable self-declaration ratio.

#### **4.2.3 Installation Rate**

The installation rate of the program was assessed based on on-site visit results. For each site, the number of products installed was validated. In several instances, that number was different from the information in the savings tracking sheet. However, the number of on-site visits conducted during the evaluation was not sufficient to allow the adjustment of tracked savings with reliable adjustment values, since on-site visits were conducted primarily for quality assurance purposes. The difference between on-site values and the tracking sheet could be an indication that modifications to the retrofit plan were made, but that these changes were not reported by the DA to the PM or that the DSMDS was not updated. The PM indicated that approximately 80 verification visits had been conducted at participant facilities in 2011. This allowed the validation of the number and type of products installed. The number of verification visits conducted at participant facilities should be increased for 2012, which would result in a more thorough verification process that could minimize discrepancies between tracked values and products installed.

For future evaluations, the Evaluator recommends increasing the number of on-site visits conducted during the evaluation process in order to obtain reliable installation ratios.

#### **4.2.4 Diversity Factor**

Based on the information received from ENSC, the peak electricity demand for Nova Scotia Power occurs between 5 pm and 7 pm on a non-holiday weekday in the winter. In order to evaluate the peak demand for demand savings coincident with the NSPI system peak, hours of operation and facility schedule were investigated for all sites visited during the evaluation process. For each site, the percentage of the total demand savings occurring during the peak demand period was established, based on contact declaration. A diversity factor of 70 percent was obtained by calculating the weighted average of all the values obtained from on-site visits and of the total savings for all the lamps considered for diversity factor calculations. This value was used for all systems, excluding LED exit signs.

#### **4.2.5 Revised Gross Savings**

Adjustment ratios are used to calculate revised gross energy and demand savings for all measures since it was impossible to reconstruct the savings from the bottom up. Adjustments are applied to the unitary wattage, the hours of operation and the installation rate to calculate the gross savings.

Savings at the generator level were calculated using a line loss factor of 1.075 between the meter and the generator. This value was calculated using the weighted average of the line loss factor values obtained from rate codes of each project in the tracking sheet, with the energy savings of the corresponding projects, with the exclusion of the "Rise" project. The line loss factors were provided by Nova Scotia Power for each rate code.

The total revised savings obtained for each category of measures implemented are presented in Table 20.

The total gross energy savings for the SBES program are estimated at 26.440 GWh at the meter and at 28.426 GWh at the generator. The total gross demand savings are estimated at 7.789 MW at the meter and at .8.373 MW at the generator.

**Table 20: Evaluation Results – Gross Energy and Demand Savings**

| Measure Category:                                   | T8s       |                                    | CFLs   | Exit Signs | T5s    | Others |
|-----------------------------------------------------|-----------|------------------------------------|--------|------------|--------|--------|
|                                                     | New Lamps | New Ballasts and Lamps or Fixtures |        |            |        |        |
| Program Tracking sheet                              |           |                                    |        |            |        |        |
| Total program tracking savings (GWh)                | 0.382     | 19.243                             | 4.590  | 0.400      | 0.067  | 1.758  |
| Total program tracking demand savings (MW)          | 0.116     | 5.827                              | 1.351  | 0.046      | 0.026  | 0.422  |
| Evaluated Energy Savings                            |           |                                    |        |            |        |        |
| Adjustment for wattage                              | 0.00%     | 0.00%                              | 0.06%  | 0.00%      | 0.00%  | 0.00%  |
| Adjustment for hours of operation                   | 0%        | 0%                                 | 0%     | 0%         | 0%     | 0%     |
| Installation rate                                   | 100%      | 100%                               | 100%   | 100%       | 100%   | 100%   |
| Total Gross Energy Savings - at Meter (GWh)         | 0.382     | 19.243                             | 4.593  | 0.400      | 0.067  | 1.758  |
| Line loss factor                                    | 1.075     | 1.075                              | 1.075  | 1.075      | 1.075  | 1.075  |
| Total Gross Energy Savings - at Generator (GWh)     | 0.411     | 20.686                             | 4.937  | 0.430      | 0.072  | 1.890  |
| Evaluated Demand Savings                            |           |                                    |        |            |        |        |
| Adjustment on demand savings for wattage            | 0.00%     | 0.00%                              | 0.04%  | 0.00%      | 0.00%  | 0.00%  |
| Installation rate                                   | 100.0%    | 100.0%                             | 100.0% | 100.0%     | 100.0% | 100.0% |
| Total Gross Demand Savings - at Meter (MW)          | 0.116     | 5.827                              | 1.352  | 0.046      | 0.026  | 0.422  |
| Diversity factor                                    | 70%       | 70%                                | 70%    | 100%       | 70%    | 70%    |
| Total Gross Peak Demand Savings - at Meter (MW)     | 0.081     | 4.079                              | 0.946  | 0.046      | 0.018  | 0.295  |
| Line loss factor                                    | 1.075     | 1.075                              | 1.075  | 1.075      | 1.075  | 1.075  |
| Total Gross Demand Savings - at Generator (MW)      | 0.125     | 6.264                              | 1.453  | 0.049      | 0.028  | 0.454  |
| Total Gross Peak Demand Savings - at Generator (MW) | 0.087     | 4.385                              | 1.017  | 0.049      | 0.019  | 0.317  |

## 4.3 INTERACTIVE EFFECTS

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling systems. In the case of the SBES program, replacement of regular lighting products installed in non-refrigerated spaces with efficient lighting products causes an increase in the heating load during winter and a decrease in the cooling load during summer. Additionally, for lighting products installed in refrigeration units, the use of efficient lighting reduces the cooling load requirement at all times, thus generating additional savings.

An interactive effects factor of -7.7 percent was used in this evaluation for products installed in regular spaces. This factor is based on a study conducted by ADS in 1992 for Hydro-Québec. The work conducted in this study was intended to modify certain parameters in building simulations of commercial buildings in Quebec in order to determine the impact of these changes on heating and cooling systems. The simulations were performed with the DOE2 software and only focused on buildings heated entirely by electricity.

The following table presents the calculation details for the interactive effects factor. The values presented take into account the proportion of commercial buildings that are electrically heated and the proportion that are air conditioned. These proportions were obtained from the on-site visits conducted for all commercial and industrial (C&I) programs, except for the C&I and Efficient Products-Direct Install programs. Data from the latter were excluded since the information collected on heating and cooling systems during the on-site visits for these programs were not representative of C&I facilities. C&I program participants include a significant proportion of industrial customers, rendering the information collected difficult to use for other C&I programs. Sites with electric heating systems were over-represented in the sample used for EP-DI on-site visits. Information for a total of 34 sites was collected to establish the interactive effects factor. For future evaluations, the Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participant facilities be collected during the C&I telephone survey campaigns conducted by ENSC, and from each participant of the SBES program. This would provide for a better evaluation of the interactive effects factor.

**Table 21: Interactive Effects Factor for Lighting Products Installed in Regular Spaces**

| Parameters                                   | % Commercial Buildings | Interactive Effects <sup>4</sup> |
|----------------------------------------------|------------------------|----------------------------------|
| Electric heating with air conditioning       | 14.71%                 | -43.4%                           |
| Electric heating without air conditioning    | 8.82%                  | -49.0%                           |
| No electric heating with air conditioning    | 52.94%                 | 5.7%                             |
| No electric heating without air conditioning | 23.53%                 | 0.0%                             |
| <b>Weighted Interactive Effects Factor</b>   | -                      | <b>-7.7%</b>                     |

<sup>4</sup> ADS ASSOCIÉS, "Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale," report presented to Hydro-Québec, 1992.

For lighting products installed in refrigeration units, the approach is based on the one used in savings calculations for the Business Energy Rebates (BER) program. Based on this approach, the interactive effects factor is +40 percent for all lighting products installed in refrigerated areas.

The gross savings including interactive effects are presented in Table 22.

**Table 22: Gross Savings at the Meter – Including Interactive Effects**

|                                                     | Energy Savings (GWh)                         |                                          | Demand Savings (MW)                          |                                          |
|-----------------------------------------------------|----------------------------------------------|------------------------------------------|----------------------------------------------|------------------------------------------|
|                                                     | Lighting Measures in Non-refrigerated Spaces | Lighting Measures in Refrigeration Units | Lighting Measures in Non-refrigerated Spaces | Lighting Measures in Refrigeration Units |
| Total Gross Savings                                 | 26.443                                       | 0.066                                    | 7.789                                        | 0.014                                    |
| Interactive Effects Factor                          | -7.70%                                       | 40%                                      | -7.70%                                       | 40%                                      |
| Total Gross Savings with Interactive Effects Factor | 24.407                                       | 0.092                                    | 7.189                                        | 0.020                                    |

After applying the interactive effects factor to the lighting measures for regular spaces, the total gross energy and demand savings at the meter for the SBES program are estimated at 24.449 GWh and at 7.209 MW, respectively.

## 4.4 NET-TO-GROSS RATIO

The NTGR evaluation of the program is based on a self-report approach, which relies on a series of questions designed to measure the influence of the program on participants' decisions to purchase program-eligible energy-efficient lighting products. These questions were included in the participant survey.

This section presents the methodology used to transform responses to the NTGR survey questions into an NTGR. For the program, the NTGR includes the assessment of two distortion effects: free-ridership and internal spillover. Once each effect is quantified, the NTGR is calculated based on this equation:

$$\text{NTGR} = (1 - \% \text{ free-ridership} + \% \text{ internal spillover}).$$

#### **4.4.1 Free-Ridership**

In the program, free-ridership can occur when participants declare they would still have purchased the energy-efficient lighting products in the absence of the program. The telephone survey included eight free-ridership questions divided into four groups that attempted to measure:

- > the probability that the customer would have purchased the same energy-efficient lighting products in the absence of the program;
- > the probability that the customer would have paid the full cost of the project in the absence of the program;
- > the factors, other than the program, that might have affected the customer's decision;
- > the temporal sequence of the program and the customer's decision.

Each group of questions is transposed into a level of program attribution which is used to calculate the global free-ridership level for each participant. The algorithm behind this calculation is presented in Appendix IX.

The most important elements of the approach used to estimate the free-ridership level of the program in 2010 were preserved in Econoler's approach. However, a few enhancements were incorporated:

- > Introduction of a 0 to 10 scoring system rather than fixed categories that were assigned weights.
- > Questions to jointly consider and rate the importance of the many likely factors that may have influenced participant energy efficiency decision-making rather than narrowly focusing on their rating of the program's importance. This question structure more accurately reflects the complex nature of real-world decision-making and helps ensure that all non-program influences are considered in the free-ridership assessment in addition to program influences.

Econoler's approach is consistent with evaluation, measurement and verification methods used in other jurisdictions such as California, New York, Oregon and Pennsylvania.

Using this approach, the survey results reveal a free-ridership level of 12.8 percent for the program. This value is very close to the 13.6 percent free-ridership level obtained for the 2010 evaluation. Products installed during retrofits conducted under the SBES program include regular CFLs and regular electronic ballasts. These products are now widely available and it is very common for business owners to purchase them on their own. To reduce the free-ridership level, the Evaluator recommends revising the list of products eligible for a rebate through the SBES program in order to restrict eligibility to high-end products that business owners would not likely install on their own.

#### 4.4.2 Spillover

The internal spillover effects of the program are measured through the participant survey. Internal spillover can occur when participants purchase eligible energy-efficient lighting products following their previous participation in the program due to its influence, thereby demonstrating the advantages of such products.

During the telephone survey, participants were asked if they had bought and installed additional efficient lighting products following their previous participation in the program. Additional questions were used to verify the eligibility of the additional purchases by asking:

- > The date of the purchase to ensure it was made after participating in the program; and
- > If they benefited from any other financing or incentive program for these additional purchases, or if they planned to submit a rebate request for these purchases in the future.

Subsequently, other questions were asked to verify the level of influence the program had on the purchases.

Finally, follow-up calls were made to participants flagged for spillover. These calls were used to confirm participant responses and collect product specifications that could not be collected during the telephone survey. These specifications (product type, quantity, product replaced, etc.) were then used to estimate the energy savings associated with the purchases. Depending on the level of influence obtained during the survey, a portion of these savings was attributed to the program.

The level of internal spillover was calculated for each participant, according to this equation.

$$\%SO = \frac{\text{kWh associated with the additional purchase} \times \text{attribution level}}{\text{kWh associated with the products installed under the program}}$$

Past evaluations revealed an extremely low level of internal spillover. This year, a new approach with follow-up calls was used to raise the opportunity to determine all potential internal spillover. However, the level of internal spillover remains low. Only eight participants out of the 61 surveyed were flagged for spillover. However, only four of them confirmed having purchased additional energy-efficient lighting products following their previous participation in the program. These additional purchases correspond to energy savings attributable to the program totalling 4.71 MWh for these participants. Spillover represented 0.8 percent of total energy savings for all the participants surveyed.

Using the free-ridership level established and considering no spillover, the NTGR value for the program is estimated at 0.88.

## 4.5 NET SAVINGS

The net savings for the program were estimated using the NTGR mentioned above. The following equation was used to calculate the program net savings.

$$\text{Net savings} = \text{Gross Evaluation Savings} \times (1 + \text{Interactive effects factor}) \times \text{NTGR}$$

This equation was used for both demand and energy savings. The results obtained are presented in Table 23. For 2011, the total net energy savings at the generator are estimated at 23.176 GWh while net demand savings at the generator are estimated at 6.820 MW.

**Table 23: Comparison of Tracked and Evaluated Savings at the Generator**

|                           | Initial Gross Savings | Installed Gross Savings | Installed Gross Savings with Interactive Effects | NTGR        | Net Savings       |
|---------------------------|-----------------------|-------------------------|--------------------------------------------------|-------------|-------------------|
| <b>Energy Savings</b>     |                       |                         |                                                  |             |                   |
| Tracked Savings from ENSC | 28.978 GWh            | 28.978 GWh              | 28.978 GWh                                       | 0.90        | 26.080 GWh        |
| <b>Evaluation Results</b> | <b>28.426 GWh</b>     | <b>28.426 GWh</b>       | <b>26.336 GWh</b>                                | <b>0.88</b> | <b>23.176 GWh</b> |
| <b>Demand Savings</b>     |                       |                         |                                                  |             |                   |
| Tracked Savings from ENSC | 8.536* MW             | 8.536 MW                | 8.536 MW                                         | 0.90        | 7.682 MW          |
| <b>Evaluation Results</b> | <b>8.373 MW</b>       | <b>8.373 MW</b>         | <b>7.750 MW</b>                                  | <b>0.88</b> | <b>6.820 MW</b>   |

\* Tracked demand savings from ENSC were calculated based on the tracking sheets received and on an estimate for "Rise" jobs for which demand savings were not available.

The net energy savings values calculated were compared to the program tracked savings for 2011. The values calculated were slightly lower than the values tracked. This can be explained by the interactive effects factor calculated for lighting products installed in non-refrigerated spaces. This factor resulted in a 7.7 percent reduction of gross savings. Moreover, the NTGR calculated for the evaluation was slightly lower than the value used for tracked savings.



## APPENDIX I - RECOMMENDATIONS

This Appendix presents all recommendations made by the Evaluator throughout the report as well as the sections where the recommendations originated.

| Sections                      | Recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <b>1. Document the major characteristics of the program:</b> The goal of the program and its objectives in terms of energy or demand savings, as well as the measures promoted by the program and their deemed savings should be included in the program manual. Furthermore, the justification for setting the financing mechanism up to 80 percent should be documented in the program manual in order to understand the rationale for this level of incentive.                                                                                                                                                                                                                                                                                                                                            |
|                               | <b>2. Include all relevant information:</b> Section 2.4 of the program manual regarding participant payments mentions that municipal utility customers are not eligible for financing or lump sum payments and are required to pay their share before the shipping of materials. There is no mention of the possibility for these customers to create an account with NSPI to specifically finance the 20 percent portion. This option should be specified in the program manual, as it is available to municipal utility customers.                                                                                                                                                                                                                                                                         |
|                               | <b>3. Remain consistent throughout the program manual with parties' names or terminology:</b> In the program flow chart, the term "labor vendor" is actually used to identify the DA. Econoler recommends always using the same terminology to avoid confusion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                               | <b>4. Provide a "base case":</b> The program manual does not provide a "base case" that provides information on how the assumed gross savings have been established. Usually, these savings are calculated with an algorithm using a series of variables such as operating time, wattage or base consumption. The identification and value of each of these variables should be available and documented for validation and updating purposes.                                                                                                                                                                                                                                                                                                                                                               |
|                               | <b>5. Provide the parameters used to estimate the program objectives:</b> After estimating the gross savings from the base case established in the program manual, the objectives are then forecast in terms of net savings. To that effect, the program objectives include any distortion effects, whether positive or negative. They also include interactive effects when not taken into account in the base case. These parameters are usually based on past evaluation results, market intelligence, secondary research and other sources. The program manual should document these parameters so that the PM and the Evaluator can keep track of the assumptions used to estimate the program objectives. The parameters should then be adjusted annually based on the most recent evaluation results. |

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Manual Content</b> | <p><b>6. Make explicit plans for post-installation inspections:</b> The criteria or basis for selecting projects to be inspected should be explained in the program manual. Also a standard inspection report could be designed and used as a performance indicator for management and evaluation purposes.</p> <p><b>7. Complete the program manual to keep track of changes and standardize the content:</b> The content of all program manuals should be standardized based on the same template so that it is easier to locate specific sections or subjects. Additionally, the program manual should include important information and changes to serve as “program memory” in case of modifications or staff changes. Moreover, the program manual content should be continually updated. The following are two examples of required updates for the SBES program manual:</p> <ul style="list-style-type: none"> <li>– The marketing name of the program has changed from “Small Business Lighting Solutions” to “Small Business Energy Solutions,” to better reflect the nature of the program. The titles in Attachments B, D, E and F in the program manual should be changed to reflect the actual program name.</li> <li>– In order to resolve material quality and delivery delays as well as recycling and disposal issues, the DAs can now purchase qualified products from any vendors they choose instead of using a sole source material vendor under contract with ENSC. These modifications to the program are sound solutions and the section regarding the contractual relationships in the program manual (section 8) should be modified in accordance with these changes.</li> </ul> |
| <b>Program Tracking Sheet</b> | <p><b>8. Present the detailed characteristics of each measure and the corresponding unitary savings to allow for savings calculation validation by the Evaluator:</b> The tracking sheet, in its current state, does not detail the components included in each measure and the unitary wattage value used for savings calculation. The information available on the tracking sheet does not allow the Evaluator to differentiate two measures with similar equipment but different key components like ballasts. However, those components have a great impact on unitary wattage values. Moreover, the absence of a unitary wattage value corresponding to a specific type of equipment does not make it possible for the Evaluator to validate the savings calculation.</p> <p><b>9. Identify measures with lighting controls:</b> Currently, the measures tracking sheet does not indicate the installation of lighting control devices, nor does it provide information on the reduction of hours of operation. This does not allow the Evaluator to identify such measures or to calculate the additional savings associated with them. The PM should develop a mechanism to allow for the identification of those measures.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Program Tracking Sheet</b>            | <p><b>10. Determine the required fields and remove the unnecessary ones:</b> The PM together with the Evaluator should determine which fields are necessary for administration and evaluation purposes and ensure that the information is systematically entered in these fields. Conversely, the fields that are not used should be removed from the tracking sheet in order to focus on useful data.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                          | <p><b>11. Make sure that all fields are systematically filled in:</b> Once the necessary fields are identified, it is recommended that the PM ensure they are systematically filled in. A protocol could be implemented to ensure that all the information is collected and entered on the tracking sheet. At the time of the analysis of the 2011 tracking sheet, the following fields included a significant number of missing values:</p> <ul style="list-style-type: none"> <li>– Building type: indicating the type of building where the measure is implemented. This field was empty in 48 percent of the records.</li> <li>– Bill account number: used to match a customer's financial and consent forms. This field was empty in 2 percent of the records.</li> <li>– Proposed hours of operation: used to calculate the energy savings. This field was empty in all the records.</li> </ul> |
|                                          | <p><b>12. Set limitations for entries and develop a validation process:</b> To ensure that incorrect values are not entered in the tracking sheet, a validation process should be developed by ENSC. This will ensure that values such as hours of operation will not exceed a defined range or that inconsistent postal codes are not entered in the database. Occurrences of these two inconsistencies were encountered in the database. The validation process could also be used to identify missing entries.</p>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Program Design and Implementation</b> | <p><b>13. Consider replacing current DAs with organizations not limited to lighting specialization:</b> The Evaluator recommends that ENSC consider replacing current DAs with organizations that are more familiar with energy efficiency programs and, therefore, not limited to one particular specialization. In that situation, the DAs would better understand the nature of the interventions conducted under any energy efficiency programs and be in a good position to promote all products eventually covered by the program.</p>                                                                                                                                                                                                                                                                                                                                                          |
|                                          | <p><b>14. Develop an evaluation plan in parallel with program design and development:</b> Econoler strongly recommends that, for each new program, an evaluation plan be prepared in parallel with program design and development. The evaluation plan will identify key variables that must be collected as part of program operation, which is usually easier than during the evaluation stage as the latter can take place several months later.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ENSC Website</b>               | <p><b>15. Supplement the ENSC website with the participant process flow chart:</b> ENSC developed a participant process flow chart in 2011 in order to make the program participation procedures clearer. This participant process flow chart could be posted on the ENSC website.</p>                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Relationship with Partners</b> | <p><b>16. Create a mailing list:</b> One DA suggests creating a mailing list to promote the program since many customers are not aware of the program in his designated area. He also suggests that landlords and property management companies need to be targeted in large city areas to open opportunities in larger non-residential buildings.</p>                                                                                                                                                                                                                                                                                                                            |
|                                   | <p><b>17. Accept faxed contracts:</b> One DA suggests accepting faxed contracts as opposed to originals to improve performance. ENSC could also develop a web-based contract as opposed to paperwork.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                   | <p><b>18. Streamline eligibility and financing procedures:</b> One DA recommends streamlining eligibility and financing procedures to improve program participation and delivery. This comment needs to be assessed in context with the fact that the program does not target chains operating multiple franchise operations. This could be reviewed since there is a multiplication potential factor that could generate significant savings. If the franchises are considered as small businesses and the program selects a few representative facilities to implement measures that prove to be cost effective, other stores could follow.</p>                                 |
| <b>Participants Perspectives</b>  | <p><b>19. Continue to promote the financial benefit:</b> The program should continue to promote the <b>financial</b> benefit of participating in the SBES program since savings on energy cost is the main participation reason.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                   | <p><b>20. Monitor satisfaction with specific aspects of program delivery:</b> The level of satisfaction towards the paperwork and procedures required to receive the <b>incentives</b> and assistance as part of program application decreased significantly compared with 2010 findings. Furthermore, completion of the project on schedule received the lowest score of satisfaction, although it is comparable to last year's results. Therefore, these aspects should receive special attention.</p>                                                                                                                                                                          |
|                                   | <p><b>21. Monitor the quality of products:</b> The respondents were asked to rate their satisfaction with various aspects of the lighting equipment that had been installed through the SBES program. The drop in satisfaction with four different aspects (the flickering of the products installed, the measure lifespan, the light quality and the energy savings) combined with the recent change with respect to the selection of the material vendor in 2011 raise a potential issue regarding the quality of products. There is no saying that the change caused such drop in satisfaction; however, Econoler still recommends closely monitoring this program aspect.</p> |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Participants Perspectives</b> | <p><b>22. Enhance program marketing and communication:</b> Increasing advertising/marketing (18%), providing more information to reduce confusion (11%) and improving interactions with program representatives (7%) were the most suggested improvements by participants for the SBES program.</p>                                                                                                                                                                                                                                                |
| <b>Impact Evaluation</b>         | <p><b>23. Correct erroneous wattage values:</b> The Evaluator recommends that the PM correct the wattage values that are deemed incorrect in the Demand-Side Management Data System, thereby eliminating any inconsistencies.</p>                                                                                                                                                                                                                                                                                                                  |
|                                  | <p><b>24. Increase the number of sites where data loggers are installed:</b> The Evaluator recommends increasing the number sites where data loggers are installed in order to obtain a more reliable self-declaration ratio.</p>                                                                                                                                                                                                                                                                                                                  |
|                                  | <p><b>25. Increase the number of on-site visits:</b> The Evaluator recommends increasing the number of on-site visits conducted during the evaluation process in order to obtain reliable installation ratios.</p>                                                                                                                                                                                                                                                                                                                                 |
|                                  | <p><b>26. Collect information on the heating source and on the use of air conditioning during C&amp;I telephone survey campaigns as well as from each participant of the SBES program:</b> The Evaluator recommends that information on the heating source and on the use of air conditioning equipment at participants' facilities be collected during the C&amp;I telephone survey campaigns conducted by ENSC, and from each participant of the SBES program. This would provide for a better evaluation of the interactive effects factor.</p> |
|                                  | <p><b>27. Revise the list of products eligible:</b> The Evaluator recommends revising the list of products eligible for a rebate through the SBES program, in order to restrict eligibility to high-end products that business owners would not likely install on their own.</p>                                                                                                                                                                                                                                                                   |

## APPENDIX II - FIRMOGRAPHICS

About one-half of the 2011 respondents provided a valid response to the question regarding energy costs as a percentage of their annual operating budget. Among them, energy costs accounted for an average of 13.8% of their annual operating budget, which is consistent with the 2010 findings. Among the 2011 respondents, energy costs accounted for less than 20% of the annual operating budget for three-quarters of the respondents (75%).

**Table 24: Energy Costs as a Percentage of Annual Operating Budget**

| Percent of Budget                                  | 2008         | 2009        | 2010         | 2011*        |
|----------------------------------------------------|--------------|-------------|--------------|--------------|
| <i>Sample Size</i>                                 | 29           | 21          | 37           | 32           |
| Less than 10%                                      | 45%          | 71%         | 68%          | 53%          |
| 10-19%                                             | 10           | 24          | 19           | 22           |
| 20-29%                                             | 28           | 5           | 19           | 3            |
| 30-39%                                             | 7            | --          | 14           | 9            |
| 40-49%                                             | 3            | --          | --           | 6            |
| 50-59%                                             | 3            | --          | --           | 3            |
| 60-69%                                             | 3            | --          | --           | 3            |
| 70-99%                                             | --           | --          | --           | --           |
| Don't know                                         | --           | --          | --           | --           |
| <b>Average Percent</b>                             | <b>15.7%</b> | <b>6.8%</b> | <b>12.1%</b> | <b>13.8%</b> |
| * Don't know responses are removed from 2011 data. |              |             |              |              |

Seven in 10 (69%) reported owning their facilities.

**Table 25: Ownership Status of Facilities**

| Status of Facilities | 2008 | 2009 | 2010 | 2011 |
|----------------------|------|------|------|------|
| <i>Sample Size</i>   | 50   | 50   | 65   | 61   |
| Own                  | 78%  | 74%  | 74%  | 69%  |
| Lease                | 22   | 26   | 25   | 31   |
| Don't know           | --   | --   | 2    | --   |

Respondents in the 2008, 2009, 2010 and 2011 samples represented a diverse variety of business types.

**Table 26: Business Type**

| <b>Business Type</b>         | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|------------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>           | <i>50</i>   | <i>50</i>   | <i>65</i>   | <i>61</i>   |
| Retail – other than mall     | 18%         | 18%         | 17%         | 15%         |
| Warehouse and storage        | 14          | --          | 5           | 13          |
| Enclosed mall or strip mall  | 2           | 2           | 2           | 10          |
| Food service/Grocery         | 2           | 8           | 8           | 8           |
| Service                      | 14          | 24          | 31          | 8           |
| Car dealership/repair        | 16          | 2           | 3           | 7           |
| Religious worship            | 2           | --          | 2           | 5           |
| Office                       | 10          | 12          | 9           | 5           |
| Transportation               | --          | 2           | --          | 5           |
| Manufacturing                | 12          | 4           | 5           | 3           |
| Health care – outpatient     | 4           | 2           | 2           | 3           |
| Lodging                      | 2           | 4           | --          | 2           |
| Government                   | --          | --          | --          | 2           |
| Electrical distribution      | --          | --          | --          | 2           |
| Health care – inpatient      | --          | --          | 5           | --          |
| Curling Rink / Bowling Alley | --          | --          | 5           | --          |
| Workshop                     | --          | 2           | 2           | --          |
| Multi-purpose                | --          | --          | 2           | --          |
| Public assembly              | --          | --          | 2           | --          |
| Vacant                       | --          | --          | 2           | --          |
| Education                    | --          | 2           | --          | --          |
| Construction                 | --          | 2           | --          | --          |
| Public Library               | --          | 2           | --          | --          |
| Public order and safety      | 4           | 2           | --          | --          |
| Wholesaler                   | --          | 2           | --          | --          |
| Animal shelter               | --          | 2           | --          | --          |
| Equipment rental             | --          | 2           | --          | --          |
| Publishing                   | --          | 2           | --          | --          |
| Other                        | --          | 4           | --          | 13          |

One-half (51%) of the 2011 respondents reported having fewer than 5 employees and the majority (90%) had fewer than 20.

**Table 27: Full-time Equivalent Workers**

| <b>Full-time Employees</b> | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|----------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>         | 50          | 50          | 65          | 61          |
| Fewer than 5               | 14%         | 12%         | 37%         | 51%         |
| 5 to 9                     | 28          | 28          | 23          | 23          |
| 10 to 19                   | 24          | 22          | 17          | 16          |
| 20 to 49                   | 22          | 36          | 11          | 7           |
| 50 to 99                   | 10          | --          | 5           | --          |
| 100 to 249                 | --          | --          | 2           | 2           |
| 250 or more                | --          | 2           | --          | --          |
| Don't know                 | 2           | --          | 6           | 2           |

Three-quarters of the 2011 respondents (74%) reported that their businesses operated less than 80 hours per week. Overall, 2011 respondents reported average operating hours of 64 hours per week.

**Table 28: Hours of Operation**

| <b>Hours of Operation</b> | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> |
|---------------------------|-------------|-------------|-------------|-------------|
| <i>Sample Size</i>        | 49          | 49          | 63          | 61          |
| Less than 40              | 2%          | 2%          | 11%         | 8%          |
| 40 to 79                  | 88          | 74          | 75          | 66          |
| 80 to 119                 | 4           | 14          | 8           | 13          |
| 120 or more               | 6           | 10          | 6           | 5           |
| Depends/varies            | --          | --          | --          | 8           |
| <b>Average hours</b>      | <b>59</b>   | <b>67</b>   | <b>60</b>   | <b>64</b>   |



Over eight out of 10 2011 respondents (84%) reported that their businesses were independent and not part of a larger company.

**Table 29: Type of Company**

| Type of Company          | 2008 | 2009            | 2010 | 2011 |
|--------------------------|------|-----------------|------|------|
| <i>Sample Size</i>       | 50   | 49              | 62   | 61   |
| Independent              | 84%  | 70%             | 82%  | 84%  |
| Part of a larger company | 16   | 30 <sup>o</sup> | 16   | 13   |
| Franchise                | --   | --              | 2    | --   |
| Other                    | --   | --              | --   | 3    |

Two-thirds of the 2011 respondents (64%) have only one business location in Nova Scotia, while one-third have more than one location.

**Table 30: Number of Business Locations in Nova Scotia**

| Number of Locations | 2011 |
|---------------------|------|
| <i>Sample Size</i>  | 61   |
| 1                   | 64%  |
| 2-10                | 23%  |
| 11-30               | 7%   |
| More than 30        | 2%   |
| Don't know          | 5%   |

---

## **APPENDIX III - INTERVIEW GUIDE WITH PROGRAM MANAGER**

### **Process Evaluation**

**Program Name: Small Business Energy Solutions**

Telephone Interview with the Program Manager

Date:

List of questions (Q) and comments (C) discussed

|                                       |
|---------------------------------------|
| <b>Source: Evaluation Report 2010</b> |
|---------------------------------------|

#### **Page II**

SBLS-R2 : What is the status of this recommendation?

SBLS-R4: What is the status of this recommendation?

SBLS – R7: What is the status of this recommendation?

#### **Page 1**

Q: In the program theory, what is the rationale to set the incentive at 80%?

#### **Page 2 & 3**

C: A process flow chart could be helpful for the future participants.

C: The logic model seems fine to us. Do you suggest any modification?

|                         |
|-------------------------|
| <b>Source: Web Site</b> |
|-------------------------|

C: No questions except maybe a process flow chart with the brochure. (Attachment A of the program manual is more a program flow chart that does not concern participants)

---

**Source: Program Manual**

---

Q: This program has changed name from Small Business Direct Install to Small Business Energy Solutions. Care to comment the reason?

C: This program manual is intended to different parties (participants' program partners, and program managers). It could be separated in three sections that are specific to each party. Care to comment?

**Page 4**

Q: What is the rational for not targeting chains operating multiple franchises? Or at least accepting a minimum number of installations?

**Page 7**

Q: If the main objective of ENSC is to save electricity, why are municipal utilities not eligible for the bill financing of 20% like the clients of NSP?

Q: What is the proportion (%) of participants who are clients of the 6 municipal utilities from the total participants?

**Page 10**

Q: What is the difference between the on-site audit lighting and the tool to establish energy savings provided by the program administrator? (one is for gathering data and the other to calculate savings from those data?)

**Page 14**

Q: On what basis (selection and numbers) do you perform site inspection?

Q: Does every site inspection have a report?

**Page 15**

Q: The incentive level seems to vary somewhat for different projects (depending on the yield) .How often does the incentive is outside the levels specified in attachment C?

Q: Does the fact that the incentives can differ from project to project creates some tracking difficulties?

**Page 16**

Q: Who approves the customer credit and how is it done?

Q: How do you verify that the measures are kept installed for their useful life (or at least 2 years)?

**Page 18**

Q: We notice that for this program you signed 4 contracts. Have you thought of outsourcing all the program activities (beside the contract with the participant) to only one organization?

Attachment A (Program Flow Chart)

Q: You are using the term labor vendor instead of material vendor. Is it the same? If yes why do you call them differently?

C: This flow chart is for the internal use of the program administrator and should not be intended to participant if the program manual is available to him.

**Attachment B**

C: The title of this document should be changed to reflect the new program name.

**Attachment C**

C: The title of this document should be changed to reflect the new program name. Insert page numbers.

Q: On the second page, can you explain the objective to achieve 27 cents/kWh and the yields of the next table (40cents, to 70 cents.)?

**Attachment E**

C: This should be for the participant. It should carry a document title, the new program name and document pages with a revision date.

**Attachment F (site inspection)**

C: Change the program name; insert page numbers and revision date.

Q: Who does the inspection?

**Attachment G (P Questionnaire)**

Q: Is this sent to all participants?

C: This questionnaire could be added in the process evaluation section of the evaluation. Can you provide us with some statistics of the responses?

C: It would be better if we introduce a scale of satisfaction (say from 1 to 10) for most of the questions instead of a straight yes or no or not sure.

C: Replace question # 3, by if the score is under .8, ask for the reason(s).

|                        |
|------------------------|
| <b>Source: General</b> |
|------------------------|

Q: Could you please describe who the program partners are, how many are they and their specific roles in the program delivery. (auditors, installation, vendors, and recycling contractor) This will help us ask the proper questions to the program partners for the process evaluation.

Q: When designing the program, did they predicted any kind of distortion effects? If yes what were they and how did you quantify them?

Q: What are the program barriers?

Q: Do you do cost effectiveness test post the evaluations?

Q: Do you have a written marketing strategy? If yes do you collect performance indicators?

Q: How would you rate the facility or difficulty to work with a comprehensive centralized database. (1 is very difficult 10 is very easy)

Q: Finally, do you have any subject or issue you would like the evaluator to investigate with the program partner (delivery agent)?

Thank you very much for your time and cooperation.

---

## **APPENDIX IV - INTERVIEW GUIDE WITH DELIVERY AGENTS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Small Business Energy Solutions**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

☐ Simple or easy

☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

☐ No

☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**



**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Small Business Energy Solutions Program**

**Q9- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners or sub-contractors (recycler contractor, electrician contractor, lighting auditors) in this program?**

**Score:**

**Q9a - If your answer to Q9 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q9b- The fact that now you chose your material vendor to get better prices has been a:**

- ☐ Positive experience
- ☐ Negative experience

**Q10 – Who provides you with leads for potential participants?**

**Q11- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

☐ Yes: which ones?

What was the confusion about?

☐ No

☐ Don't know

**Q12- What is your opinion in regard to the program name that has changed since its first implementation (Small Lighting Business Solutions Program to Small Energy Business Solutions Program)?**

**Q13- What is your opinion in regard to program on-course modifications other than the change of program name (e.g., more products to install, expand territory or any other modification)?**

☐ Easy to adjust to the way you work

☐ Requires minor changes to the way you work

☐ Requires major changes to the way you work

☐ No opinion

**Q14- Did you receive any complaints from other parties involved in the delivery of that program?**

☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party.)

☐ No

☐ Don't know

**Q14a- What was the complaint about?**

**Q15 – In your opinion, what are the main barriers to the implementation of this program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

## **APPENDIX V - INTERVIEW GUIDE WITH ELECTRICIANS**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Small Business Energy Solutions**

**How to fill this form:**

This is a word document that integrates some form features. All you have to do is place your mouse pointer on the shaded sections and write your answer. You cannot write anywhere else in the document since it is a form. For the boxes, just click on the one you chose. Click again if you want to uncheck it.

Please complete this form within the next 48 hours, [save the file](#) and send it back at the following email address: [szariffa@videotron.ca](mailto:szariffa@videotron.ca).

Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Small Business Energy Solutions Program**

**Q9- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners or sub-contractors (recycler contractor, delivery agent, lighting auditors) in this program?**

**Score:**

**Q9a - If your answer to Q9 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q10 – Who provides you with leads for potential participants?**

**Q11- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Q12- What is your opinion in regard to the program name that has changed since its first implementation (Small Lighting Business Solutions Program to Small Energy Business Solutions Program)?**

**Q13- What is your opinion in regard to program on-course modifications other than the change of program name (e.g., more products to install, expand territory or any other modification)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion

**Q14- Did you receive any complaints from other parties involved in the delivery of that program?**

- ☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party)
- ☐ No
- ☐ Don't know

**Q14a- What was the complaint about?**

**Q15 – In your opinion, what are the main barriers to the implementation of this program by order of importance?**



Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name

Date

Phone number

E-mail

---

## **APPENDIX VI - INTERVIEW GUIDE WITH CONTRACTOR**

### **PROCESS EVALUATION QUESTIONNAIRE FOR ENSC ENERGY EFFICIENCY PROGRAM PARTNERS**

**Program Name: Small Business Energy Solutions**

**How to fill this form:**

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Thank you!

#### **Part I: General Questions**

**Please indicate your company name:**

**Q1 - How would you define your role(s) as an ENSC energy efficiency program partner?**

**Q1a – How long have you had that role (specify months or years)?**

**Q1b - If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how was this transition perceived in the market?**

- ☐ Not applicable
- ☐ Unnoticed
- ☐ Some confusion
- ☐ A lot of confusion
- ☐ Don't know

**Q1c- If you were a program partner before it changed status and name from Nova Scotia Power to ENSC, how did this transition affect your relationship with the Program Administrator?**

- ☐ Not applicable
- ☐ It was the same Program Administrator
- ☐ I had to deal with a new PA
- ☐ The transition went smoothly
- ☐ The transition caused some delays or adjustments
- ☐ Other, please comment

**Q2 - On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you characterize your relationship with the ENSC Program Administrator?**

**Scale:**

**Q2a- If your answer to Q2 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Reason(s):**

**Q3 – Did you receive any complaints from participants in the program?**

- ☐ Yes

**What was (were) the complaint(s) about?**

- ☐ No
- ☐ Don't Know
- ☐ Refused
- ☐ Not applicable

**Q4 – How would you qualify your participation process in this program?**

- ☐ Simple or easy
- ☐ Complex

**Q4a - If you checked the Complex box, please elaborate.**

- ☐ No comment / no opinion

**Q5- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your satisfaction in regard to the overall program?**

**Q5a- If your answer to Q5 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q6 – Do you have any suggestion to improve the program?**

- ☐ No
- ☐ Yes

**Q6a- If you answered Yes, please explain the nature of the improvement(s):**

**Q7 – On a scale from 1 to 10 (where 1 is very unsatisfied and 10 is very satisfied), what is your satisfaction level in regard to the marketing and outreach activities to implement the program?**

**Q 7a - If your answer to Q7 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q8 – Last year, have you been interviewed by another evaluator about the same program?**

- ☐ Yes
- ☐ No
- ☐ Not applicable

**Q8a – If you answered Yes to Q8, we would like your opinion on the frequency of these evaluations.**

- ☐ Too frequent
- ☐ Adequate
- ☐ No opinion

## **Part II: Questions Specific to the Small Business Energy Solutions Program**

**Q9- On a scale from 1 to 10 (where 1 is very bad and 10 is excellent), how would you rate your relationship with the other partners or sub-contractors (delivery agent, lighting auditors) in this program?**

**Score:**

**Q9a - If your answer to Q9 was equal to or less than 8, would you care to share the reason or reasons for such a score?**

**Q10 – Who provides you with leads for potential participants?**

**Q11- In delivering the program, did you experience or witness any confusion in the market among the parties, including yours and/or the participants?**

- ☐ Yes: which ones?

What was the confusion about?

- ☐ No
- ☐ Don't know

**Q12- What is your opinion in regard to the program name that has changed since its first implementation (Small Lighting Business Solutions Program to Small Business Energy Solutions Program)?**

**Q13- What is your opinion in regard to program on-course modifications other than the change of program name (e.g., more products to install, expand territory or any other modification)?**

- ☐ Easy to adjust to the way you work
- ☐ Requires minor changes to the way you work
- ☐ Requires major changes to the way you work
- ☐ No opinion

**Q14- Did you receive any complaints from other parties involved in the delivery of that program?**

- ☐ Yes: If yes, from which party? (Please do not mention names, just the position of the party.)
- ☐ No
- ☐ Don't know

**Q14a- What was the complaint about?**

**Q15 – In your opinion, what are the main barriers to the implementation of this program by order of importance?**

Thank you very much for your time and cooperation. Your answers will be treated in total confidentiality (no names will ever be mentioned in the evaluation report) and we hope that they will contribute to improving program performance. If we need to clarify some of your answers, we might call you back.

Your name:

Date:

Phone number

E-mail

## **APPENDIX VII - PARTICIPANT SURVEY QUESTIONNAIRE**

### **Participant Survey**

#### **ENSC Small Business Energy Solutions Program**

Oct 5, 2011

Could I speak with [INSERT NAME]?

1. Yes [GO TO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GO TO INTRODUCTION]

[INTRODUCTION]

Hello, I am with CRA (Corporate Research Associates), and we are performing an evaluation of energy efficiency services provided by Efficiency Nova Scotia Corporation. Our records indicate that you or your firm recently participated in Efficiency Nova Scotia Corporation's Small Business Energy Solutions Program. We would appreciate your collaboration in answering questions related to your participation in this program. The information you provide will be used to help Efficiency Nova Scotia Corporation evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

In the past, the Small Business Energy Solutions Program was also known as the Small Business Lighting Solutions Program. Throughout the questionnaire, I will refer to it as the "Small Business Energy Solutions Program".

You may know Nova Scotia Power as the sponsor of this program. However, since 2011 the program is now sponsored by Efficiency Nova Scotia Corporation.

### **VERIFICATION AND RECALL**

- V1. Our records indicate that your company or organization participated in Efficiency Nova Scotia's Small Business Energy Solutions Program. Is this correct?
1. Yes (Go TO V3)
  2. No



V2. Is there someone else at your company or organization who would know about your company or organization's participation in Efficiency Nova Scotia's Small Business Energy Solutions Program?

1. Yes (Ask for name: \_\_\_\_\_ and telephone #: \_\_\_\_\_) (Thank and terminate; schedule interview with best contact)
2. No (Thank and terminate)

V3. Are you the person in your company or organization who is most knowledgeable about your experience with the Small Business Energy Solutions Program?

1. Yes (if YES go to V5)
2. No

V4. We would like to talk to the person who is the most knowledgeable about your experience with the Small Business Energy Solutions Program. Could you give me the name and telephone number of this person? [Probe this individual may be an engineer, equipment contractor, or utility account manager].

Name: \_\_\_\_\_

Telephone #: \_\_\_\_\_

(Note: Thank and terminate call. Schedule interview with best contact regarding experience with the program.)

V5. According to our information, through its participation in the Small Business Energy Solutions Program, your business or organization received a rebate to install *energy-efficient* lighting products in the facility located at [FACILITY ADDRESS STREET]. When answering the survey questions, please take into account only this facility.

## **REASONS FOR PARTICIPATING & PREVIOUS PURCHASES [P SERIES]**

P1. Did your company or organization participate in any other Nova Scotia Power or Efficiency Nova Scotia energy efficiency programs before participating in the Small Business Energy Solutions Program?

1. Yes
2. No (Go to P4)
98. (Don't know) (Go to P4)
99. (Refused) (Go to P4)

P2. [IF P1 = 1] Which programs did your company or organization participate in prior to the Small Business Energy Solutions Program? **(Please specify program(s). If cannot recall the program names include a short description.)**

- a. \_\_\_\_\_ Program 1
- b. \_\_\_\_\_ Program 2
- c. \_\_\_\_\_ Program 3
- d. \_\_\_\_\_ Program 4

P3. **(REPEAT FOR EACH PROGRAM IDENTIFIED IN P2)** In what year did your company or organization participate in [Program x]? **ACCEPT MULTIPLE YEARS**

- 1. Before 2000
- 2. 2000
- 3. 2001
- 4. 2002
- 5. 2003
- 6. 2004
- 7. 2005
- 8. 2006
- 9. 2007
- 10. 2008
- 11. 2009
- 12. 2010
- 13. 2011
- 98. (Don't Know)
- 99. (Refused)

P4. How did you first learn about the Small Business Energy Solutions Program? [RANDOMIZE AND READ 1-8, THEN READ CODE 96] **(multiple responses)**

- 1. From a phone call from a Small Business Energy Solutions Program representative
- 2. From Small Business Energy Solutions Program literature I received in the mail
- 3. From Efficiency Nova Scotia's website
- 4. From a Efficiency Nova Scotia presentation
- 5. From a Efficiency Nova Scotia staff person
- 6. From a contractor or vendor
- 7. From a business associate or friend (word of mouth)
- 8. From someone who had previously participated in the Small Business Energy Solutions program
- 96. Or some other way? (Please Specify: \_\_\_\_\_)

98. (Don't know)

99. (Refused)

P5. What was the SINGLE most important reason your company or organization chose to participate in the program? **(DO NOT READ – accept one response)**

1. (To take advantage of program incentives)

2. (To see what else I should be doing as part of a planned project)

3. (To save on energy costs/bills)

4. (To reduce maintenance costs)

5. (To improve existing lighting conditions)

6. (To find ways to reduce carbon footprint)

7. (To help protect the environment)

8. (To replace non-working equipment)

9. (Recommended by utility account rep)

10. (Recommended by contractor)

11. (Past participation in utility programs)

96. (Other (Please explain \_\_\_\_\_))

98. (Don't know/Don't recall) (Go to P7)

99. (Refused) (Go to P7)

P6. [DO NOT POSE IF 98 OR 99 IN Q.P5] What was SECOND most important reason your company or organization chose to participate in the program? **(DO NOT READ – accept one response – SAME LIST AS P5)**

P7. Prior to your company or organization participating in the Small Business Energy Solutions Program, had your company or organization purchased energy-efficient lighting products of any type?

1. Yes

2. No (Go to FR1)

98. (Don't know/Don't recall) (Go to FR1))

99. (Refused) (Go to FR1)

P8. What purchases of energy-efficient lighting products had your company or organization made before participating in the Small Business Energy Solutions Program? (**Record all that apply**) **READ LIST**

1. CFLs, or compact fluorescent lamps
2. LED exit lights
3. Replaced T-12 lighting with high efficiency lighting—T-8s or T-5s
4. Metal Halide or High Pressure Sodium
96. Did your company or organization make any other purchases of energy-efficient lighting products before participating in the Small Business Energy Solutions Program?  
(Specify: \_\_\_\_\_)
98. (Don't know/Don't recall)
99. (Refused)

## **FREE-RIDERSHIP [FR series]**

FR1. BEFORE participating in the Small Business Energy Solutions Program, did your company or organization have plans to install the specific *energy-efficient* lighting products that were installed through the Program?

1. Yes
2. No
98. (Don't know)
99. (Refused)

**FR1a. IF FR1=YES, THEN ASK:** I just want to make sure I understand - **Before** you decided to participate in the Efficiency Nova Scotia Small Business Energy Solutions Program, you had already made the decision to install the *energy-efficient* lighting products?

1. Yes
2. No
98. (Don't know)
99. (Refused)

**[READ FIRST TIME THROUGH ONLY]** Now I would like to ask you to consider what actions you would have taken in the absence of the Small Business Energy Solutions Program.

FR2. If your company or organization had not participated in the Small Business Energy Solutions **Program**, what is the likelihood that you would have taken one of the following actions? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Taken the Action,” and a 10 indicating that you “Definitely **Would Have** Taken the Action.” AFTER FIRST TIME THROUGH THE SEQUENCE, START HERE FOR SECOND AND SUBSEQUENT SEQUENCES. START SECOND/SUBSEQUENT SEQUENCES BY SAYING: “AND NEXT, In the absence of the Program, would you have . . . DO NOT ACCEPT A RANGE – POSE FR2 SEQUENCE IN ORDER/DO NOT RANDOMIZE

FR2a. ...installed exactly the same energy-efficient lighting products that you installed through the Program?

\_\_\_Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2b. ...installed standard lighting products instead of energy-efficient lighting products?

\_\_\_Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

FR2c. ...installed exactly the same energy-efficient lighting products that you installed through the Program *but at a later date*?

\_\_\_Response                      \_\_\_98 Don't Know      \_\_\_99 Refused

**IF FR2c > 5, then ask:**

**FR2cc. DO NOT POSE FR2cc IF DON'T KNOW OR REFUSED IN Q.FR2c** You indicated in your previous response that if the Small Business Energy Solutions program had not been available there was an [FR2c] in 10 likelihood that you would have installed the same lighting products *but at a later date*. Approximately how many months later would you have installed these products? DO NOT READ RESPONSES - PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

1. \_\_\_\_\_ months later
96. (Never)
97. (At the same time)
98. (Don't Know)
99. (Refused)

---

**IF RESPONDENT HAS DIFFICULTY SPECIFYING AN FR2cc ANSWER IN MONTHS, READ:**

Would it have been within...

1. Less than 6 months?
2. 6 months to less than 1 year later?
3. 1 to less than 2 years later?
4. 2 to less than 3 years later?
5. 3 to less than 4 years later?
6. 4 or more years later?
7. (Never)
98. (Don't Know)
99. (Refused)

FR3. **Efficiency** Nova Scotia paid up to 80% of the \$[TOTAL PROJECT COST] total project cost. If your company had not received the incentive from Efficiency Nova Scotia, would you have done the project and paid for the full cost of the project, including the portion covered by the incentive? Please answer on a scale of 0 to 10, with a 0 indicating that you “Definitely **Would Not** Have Paid the full project cost” and a 10 indicating that you “Definitely **Would Have** Paid the full project cost.” PROBE FOR SPECIFIC RESPONSE – DO NOT ACCEPT A RANGE

\_\_\_Response                      \_\_\_88 Don't Know      \_\_\_99 Refused

FR4. Next, I'm going to ask you to rate the importance of the Program as well as other factors that might have influenced your decision to install the *energy-efficient* lighting products. Think of the degree of importance as being shown on a scale where 0 means “Not at all important” and 10 means “Extremely important.” Now using this scale please rate the importance of each of the following in your decision to implement the energy-efficient lighting products you installed through the Program:

| Factor<br>(READ AND RANDOMIZE)                                                                                                                        | Responses                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| a. Efficiency Nova Scotia Financial Assistance                                                                                                        | ___ Response ___98 Don't Know ___99 Refused |
| b. Information received during the initial contact by the program representative.                                                                     | ___ Response ___98 Don't Know ___99 Refused |
| c. Efficiency Nova Scotia funded lighting audit.                                                                                                      | ___ Response ___98 Don't Know ___99 Refused |
| d. Recycling of removed lamps and fixtures                                                                                                            | ___ Response ___98 Don't Know ___99 Refused |
| e. Your company or organization's corporate policy or guidelines regarding the purchase of equipment                                                  | ___ Response ___98 Don't Know ___99 Refused |
| f. The standard practice in your industry                                                                                                             | ___ Response ___98 Don't Know ___99 Refused |
| g. Existing energy efficiency code                                                                                                                    | ___ Response ___98 Don't Know ___99 Refused |
| h. Previous experience with the Small Business Energy Solutions Program, or a similar program either from Efficiency Nova Scotia or Nova Scotia Power | ___ Response ___98 Don't Know ___99 Refused |

## **SPILLOVER [SP series]**

SP1. Now I'd like you to think of the time **since you participated** in the Small Business Energy Solutions Program. Has your company purchased and installed any additional energy-efficient lighting products on its own for this facility

1. Yes
2. No [Go to S1]
98. (Don't know [Go to S1])
99. (Refused) [Go to S1]

**SP2\_2. IF SP1= YES, THEN ASK:** I just want to make sure I understand - **After** you participated in the Small Business Energy Solutions Program, your company installed additional energy-efficient lighting products on its own for this facility. Is that correct?

- 1 Yes ☐ SP3
- 2 No ☐ Go to S1
98. (Don't know) Go to S1
99. (Refused) Go to S1

From now on, I will specifically talk about the additional energy-efficient lighting products your company installed on its own after participating in the Small Business Energy Solutions Program.

SP3. [IF SP2\_2 = 'YES'] Have the additional energy-efficient lighting products purchased benefited from any other financing or incentive from any other *Efficiency Nova Scotia* program, or do you plan to submit a funding request for these purchases in the future?

1. Yes [Go to S1]
2. No
96. (Don't know [Go to S1])

SP4. [IF SP3 = 2 'NO'] I would like to know what are the additional energy-efficient lighting products that you have installed on your own after participating in the Small Business Energy Solutions Program. Did you install...



SP4a. Compact Fluorescent Lamps (CFLs)?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4b. Halogen PAR lamps?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4c. Fixtures with T8 fluorescent lamps?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4d. Fixtures with T5 high output fluorescent lamps?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4e. Metal Halide lamps?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4f. High Pressure Sodium (HPS) lamps?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4g. L-E-D exit signs?

- 1. Yes
- 2. No
- 98. (Don't know)

SP4h. Other energy-efficient lighting products?

- 1. Yes
- 2. No
- 98. (Don't know)

SP5. [IF SP3 = 2 'NO'] Did your experience with the energy-efficient lighting products installed through the Small Business Energy Solutions Program influence your decision to install some or all of these additional energy-efficient lighting products on your own? Please, give your answer on a scale of 0 to 10, where 0 indicates that the Small Business Energy Solutions Program "had no influence at all on your decision to install the energy-efficient lighting" and 10 indicates that the program was "extremely influential to your decision to install the energy efficiency lighting." **[RECORD RESPONSE 0-10, 98 = Don't know, 99 = REFUSED] DO NOT ACCEPT A RANGE**

## **SATISFACTION & FUTURE PURCHASE INTENTIONS [S series]**

S1. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how satisfied are you with the following aspects of the lighting installed through the Small Business Energy Solutions Program? **[RANDOMIZE]** [98 = Don't know/Don't recall, 99 = Refused] **DO NOT ACCEPT A RANGE**

- a. ☐ Light quality
- b. ☐ Brightness
- c. ☐ How long it takes them to come on
- d. ☐ Flickering
- e. ☐ How long they last
- f. ☐ Energy savings provided by the measure

S2. Also on a scale of 1 to 5, where 1 means 'not at all satisfied' and 5='very satisfied', how satisfied are you with the following aspects of your experience of the Small Business Energy Solutions Program? [RANDOMIZE 1-15, THEN 16; 98 = Don't know/Don't recall, 99 = Refused] **DO NOT ACCEPT A RANGE**

1. ☐ Single point of contact
2. ☐ Interaction and communication with delivery agent / contractor
3. ☐ Initial contact from delivery agent / contractor
4. ☐ On-site lighting audit
5. ☐ Audit technician or contractor
6. ☐ Quality of audit recommendations
7. ☐ Audit cost and savings analysis
8. ☐ Assistance with program application
9. ☐ Scheduling and timing of the installation
10. ☐ The installation process
11. ☐ Capabilities of installers or contractors doing installation work
12. ☐ Completion of project on schedule
13. ☐ Project incentive amount
14. ☐ Quality of vendors who provided recommendations
15. ☐ Paperwork and procedures required to receive incentives
16. ☐ The program overall

S3. On a scale of 1 to 5, where 1='not at all likely' and 5='very likely', how likely will your company or organization be to purchase energy-efficient products, including but not limited to energy-efficient lighting, when installing or replacing energy-using products for your business in the future? [98 = Don't know/Don't recall, 99 = Refused]

## **BARRIERS TO ACTION & RECOMMENDATIONS FOR IMPROVEMENTS [B series]**

B1. Does your company or organization own or lease the space you occupy at this location?

1. ☐ Own (Go to B4)
2. ☐ Lease
98. (Don't know/Don't recall) (Go to B4)
99. (Refused) (Go to B4)

- B2. Did you have to get permission from the building owner to participate in the Small Business Energy Solutions Program?
1. ☐ Yes
  2. ☐ No (Go to B4)
  98. (Don't know/Don't recall) (Go to B4)
  99. (Refused) (Go to B4)
- B3. On a scale of 1 to 5, where 1='not a significant barrier' and 5='a very significant barrier' how much of a barrier was obtaining permission from the owner in order to participate in the Small Business Energy Solutions Program? [98 = Don't know/Don't recall, 99 = Refused]
- B4. Were there any challenges or barriers that your company or organization faced in implementing the energy efficiency measures provided through the program?
1. ☐ Yes
  2. ☐ No (Go to B7)
  98. (Don't know/Don't recall) (Go to B7)
  99. (Refused) (Go to B7)
- B5. What was the SINGLE most important barrier? (**Do not read - one response**)
1. ☐ (Concern that actual bill savings would be less than estimated)
  2. ☐ (Lack of information to make an informed decision)
  3. ☐ (Too little incentive)
  4. ☐ (Too much work required to obtain funding)
  5. ☐ (Too little information about the program)
  6. ☐ (Cost savings not worth the effort of applying)
  7. ☐ (Approval takes too long)
  8. ☐ (Lack of financing)
  9. ☐ (Energy-efficient equipment does not meet payback requirements)
  10. ☐ (Decision made elsewhere)
  11. ☐ (Do not own building – have to work through owner)
  12. ☐ (lack of technical knowledge)
  13. ☐ (lack of time / too busy)
  14. ☐ (focused on core business)
  96. ☐ (Other (Specify: \_\_\_\_\_))
  98. (Don't know/Don't recall) (Go to B7)
  99. (Refused) (Go to B7)

- B6. What was the SECOND most important barrier? (**Do not read - one response – same list as B5**)
- B7. On a scale of 1 to 5, where 1='not at all important' and 5='very important', how important is reducing energy usage to your company or organization? [98 = Don't know/Don't recall, 99 = Refused]
- B8. On a scale of 1 to 5, where 1='not at all important' and 5='very important', how important is managing energy costs to your company or organization? [98 = Don't know/Don't recall, 99 = Refused]
- B9. Approximately what percent of your annual operating budget do energy costs account for? [998 = Don't know/Don't recall, 999 = Refused] \_\_\_% **PROBE TO RECEIVE A SPECIFIC RESPONSE, AND ACCEPT A RANGE ONLY IF NECESSARY**
- B10. Do you have any suggestions on how to improve the Small Business Energy Solutions Program? Consider all aspects of the program: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with delivery agent / contractors, and program forms.
- B11. Would a figure illustrating the various steps to follow in order to participate in the Small Business Energy Solutions Program have facilitated your participation in the program? Would you say it would have facilitated your participation in the program significantly, somewhat, slightly or not at all?
1. \_\_\_ Significantly
  2. \_\_\_ Somewhat
  3. \_\_\_ Slightly, or
  4. \_\_\_ Not at all
  96. (Depends on what the figure or illustration would have been)
  97. (This kind of document already exists)
  98. (Don't know)
  99. (Refused)

## **FIRMOGRAPHICS [F series]**

F1. What is the main building activity where the energy efficiency improvements were implemented? [DO NOT READ—BUT CONFIRM WITH RESPONDENT THAT THE CATEGORY YOU CHOOSE IS CORRECT]

1. ☐ Education
2. ☐ Food Sales (grocery)
3. ☐ Food Service (restaurant)
4. ☐ Health Care - Inpatient
5. ☐ Health Care - Outpatient
6. ☐ Lodging
7. ☐ Mercantile – Enclosed and Strip Malls
8. ☐ Mercantile – Retail (Other than Mall)
9. ☐ Office
10. ☐ Public Assembly
11. ☐ Public Order and Safety
12. ☐ Religious Worship
13. ☐ Service
14. ☐ Warehouse and Storage
15. ☐ Manufacturing (Identify Industry Type \_\_\_\_\_  
(e.g., chemical, food, paper, etc.))
16. ☐ Other? \_\_\_\_\_
17. ☐ Vacant
98. ☐ (Don't know)
99. ☐ (Refused)

F3. Approximately how many full-time equivalent workers are employed at this facility?

1. ☐ Fewer than 5
2. ☐ 5 to 9
3. ☐ 10 to 19
4. ☐ 20 to 49
5. ☐ 50 to 99
6. ☐ 100 to 249
7. ☐ 250 or More
98. ☐ (Don't know)
99. ☐ (Refused)

F4. We want to estimate the number of operating hours of the building where the energy efficiency improvements were implemented.

F4a. On average, how many hours per day is the facility open?

[RECORD NUMBER OF HOURS 0-24, ACCEPT DECIMAL] [98 = Don't know/don't recall, 99 = Refused]

F4b. How many days per week is the facility open?

[RECORD NUMBER OF DAYS 0-7, ACCEPT DECIMAL] [98 = Don't know/don't recall, 99 = Refused]

F4c. And how many weeks per year is the facility open?

[RECORD NUMBER OF WEEKS 0-52, ACCEPT DECIMAL] [98 = Don't know/don't recall, 99 = Refused]

F5. Is your company independent, or part of a larger company?

- 1. Independent
- 2. Part of a larger company
- 96. Other (\_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

F6. How many business locations does your organization have in Nova Scotia? **[RECORD A NUMBER 1-99; 998 = Don't know, 999 = Refused]**

END.

Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

## APPENDIX VIII - ON-SITE VISIT PROTOCOL

### 1 GENERAL INFORMATION

Date of visit: \_\_\_\_\_

Econoler site number \_\_\_\_\_

Business Name: \_\_\_\_\_

Site contact Name: \_\_\_\_\_

Person met during site visit \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

Type of building:

|                       |                          |                             |                          |                        |                          |
|-----------------------|--------------------------|-----------------------------|--------------------------|------------------------|--------------------------|
| Retail:               | <input type="checkbox"/> | Manufacturing / Industrial: | <input type="checkbox"/> | Grocery / Supermarket: | <input type="checkbox"/> |
| College / University: | <input type="checkbox"/> | Multi-unit res.:            | <input type="checkbox"/> | Other (Specify):       | <input type="checkbox"/> |

### 2 BUILDING HEATING/COOLING SYSTEM DESCRIPTION

Heating Source: Please fill the table below for each heating source at the site

|                                  | Heating system 1 | Heating system 2 | Heating system 3 | Heating source 4 |
|----------------------------------|------------------|------------------|------------------|------------------|
| Heat source                      |                  |                  |                  |                  |
| Heating system type              |                  |                  |                  |                  |
| Heating system efficiency or COP |                  |                  |                  |                  |

Cooling system: Please fill the table below for each cooling source at the site

|                            | Cooling system 1 | Cooling system 2 | Cooling system 3 | Cooling system 4 |
|----------------------------|------------------|------------------|------------------|------------------|
| Cooling system type        |                  |                  |                  |                  |
| Cooling system SEER or COP |                  |                  |                  |                  |



### 3 FACILITY OPERATION HOURS AND LIGHTING USAGE

Facility occupancy schedule:

*Please fill the table below for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional sheets if necessary.*

| Occupancy schedule                                                        | 1: Normal |         | 2 (specify): _____ |         | 3 (specify): _____ |         |
|---------------------------------------------------------------------------|-----------|---------|--------------------|---------|--------------------|---------|
|                                                                           | Weekdays  | Weekend | Weekdays           | Weekend | Weekdays           | Weekend |
| Number of day with regular schedule per year                              |           |         |                    |         |                    |         |
| Number of day with regular holidays schedule per year                     |           | ----    |                    | ----    |                    | ----    |
| Number of days with no occupancy per year (For example: seasonal closure) |           |         |                    |         |                    |         |
| Total number of day per year                                              | 261       | 104     | 261                | 104     | 261                | 104     |

Normal week/holidays lighting operation schedule (hours per day):

*Please fill the table below for each lighting schedule reported by the site contact as usage could vary for each section of the facility. Use additional sheets if necessary.*

| Schedule # | Lighting schedule                            | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|----------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours (for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |
| 2          | Operating hours                              |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |
| 3          | Operating hours                              |        |         |      |      |      |      |      |          |
|            | Hours per day                                |        |         |      |      |      |      |      |          |

## 4 MEASURES INFORMATION

| Fluorescent lighting                                                                                                                                         |              |              |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|
|                                                                                                                                                              | FL Section 1 | FL Section 2 | FL Section 3 |
| Measure location                                                                                                                                             |              |              |              |
| Type – Baseline fixtures ( <i>From database, for example T8-2Lamps-4FOOT</i> ):                                                                              |              |              |              |
| Type – Baseline fixtures ( <i>Contact declaration/Visual check of spare baseline parts if still in stock, for example T8-2Lamps-4FOOT</i> ):                 |              |              |              |
| Type – Fluorescent fixtures installed: ( <i>From database or example T8-2Lamps-4FOOT</i> ):                                                                  |              |              |              |
| Type – Fluorescent fixtures installed ( <i>Contact declaration, for example T8-2Lamps-4FOOT</i> ):                                                           |              |              |              |
| Number – Baseline fixtures ( <i>From database</i> ):                                                                                                         |              |              |              |
| Number – Baseline fixtures ( <i>Contact declaration</i> ):                                                                                                   |              |              |              |
| Fluorescent lighting                                                                                                                                         |              |              |              |
| Number – Fluorescent fixtures installed ( <i>From database</i> ):                                                                                            |              |              |              |
| Number – Fluorescent fixtures installed ( <i>On-site validation</i> ):                                                                                       |              |              |              |
| Type – Baseline lamp ballast ( <i>From database, for example: magnetic, electronic, etc.</i> ):                                                              |              |              |              |
| Type – Baseline lamp ballast ( <i>Contact declaration/Visual check of spare baseline parts if still in stock, for example: magnetic, electronic, etc.</i> ): |              |              |              |
| Type – Fluorescent lamp ballasts installed ( <i>From database for example: magnetic, electronic, etc.</i> ):                                                 |              |              |              |

Type – Fluorescent lamp ballasts installed  
*(On-site validation):*


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Type – Baseline lamps *(From database):*


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---

Type – Baseline lamps *(Contact declaration/  
Visual check of spare baseline parts if still in  
stock):*


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Type – New fluorescent lamps *(From  
database):*


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Type – New fluorescent lamps installed  
*(On-site validation):*


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Number – Baseline lamps installed, per  
fixture *(From database):*


---

---

---

Number – Baseline lamps installed per  
fixture *(Contact declaration):*


---

---

---

Number – Fluorescent lamps installed per  
fixture *(From database):*


---

---

---

Number – Fluorescent lamps installed per  
fixture *(On-site validation):*


---

---

---

Power – Baseline lamps [W] *(From  
database):*


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---

### Fluorescent lighting

Power – Baseline lamps [W] *(Contact  
declaration / Visual check of spare baseline  
parts if still in stock):*


---

---

---

Power – Florescent lamps installed [W]  
*(From database):*


---

---

---

Power – Florescent lamps [W] *(On-site  
validation):*


---

---

---

Validate that all lamps are still installed  
and not burnt. If some are burnt or  
missing, indicate how many:

---

---

---

When were the lamps removed or when  
did they burn?

---

---

---

Is the facility manager planning to have  
them replaced? If, not why? Are they OK  
with the reduced light level?

---

---

---

Hours of use per year *(From database)*


---

---

---

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

Hours of use for equipment: *Indicate the corresponding annual hours:*

Percentage of fixtures that remain ON when the facility is unoccupied (for example: security lighting), for each section (*Contact declaration*):

Percent of the time when both lighting and cooling are ON for each section (*Contact declaration*):

Indicate the corresponding cooling system number for each section (*Site validation/Contact declaration*):

Percent of the time when both lighting and heating are ON for each section (*Contact declaration*):

Indicate the corresponding heating system number for each section (*Site validation/Contact declaration*):

### New CFL Screw-in/Hardware

|                                                                                                           | CFL Section 1 | CFL Section 2 | CFL Section 3 |
|-----------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|
| Measure location:                                                                                         |               |               |               |
| Type Baseline lamp ( <i>From database</i> ):                                                              |               |               |               |
| Type Baseline lamp ( <i>Contact declaration/Visual check of spare baseline parts if still in stock</i> ): |               |               |               |
| Number – Baseline lamps ( <i>From database</i> ):                                                         |               |               |               |
| Number – Baseline lamps ( <i>Contact declaration</i> ):                                                   |               |               |               |
| Number – CFL Hardware installed ( <i>From database</i> ):                                                 |               |               |               |

Number – CFL Hardwire installed (*On-site validation*):

---

Number – CFL screw-in installed (*From database*):

---

Number – CFL screw-in installed (*On-site validation*):

---

Power – Baseline lamps [W] (*From database*):

---

Power – Baseline lamps [W] (*Contact declaration/ Contact declaration/Visual check of spare baseline parts if still in stock*):

---

Power – CFL installed [W] (*From database*):

---

Power – CFL installed [W] (*On-site validation*):

---

Hours of use per year (*From database*)

---

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

---

### **New CFL Screw-in/Hardwire**

Hours of use for equipment: *Indicate the corresponding annual hours:*

---

Percentage of fixtures that remain on when the facility is unoccupied (for example: security lighting), for each section (*Contact declaration*):

---

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

---

Indicate the corresponding cooling system number for each section (*Site validation/Contact declaration*):

---

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

---

Indicate the corresponding heating system number for each section (*Site validation/Contact declaration*):

Validate that all lamps are still installed and not burnt. If some are burnt or missing, indicate how many:

When were the lamps removed or when did they burn?

Is the facility manager planning to have them replaced? If, not why? Are they OK with the reduced light level?

### Exit sign LEDs

# 1

# 2

# 3

Measure location

Type – Baseline Exit sign lamp before replacement (*From database*):

### New CFL Screw-in/Hardwire

Type – Baseline Exit sign lamp before replacement (*Contact Declaration / Visual check of spare baseline parts if still in stock*):

Number – Baseline lamps (*From database*):

Number – Baseline lamps (*Contact Declaration*):

Number – Exit sign LEDs (*From database*):

Number – Exit sign LEDs (*On-site validation*):

Power – Baseline lamp [W] (*From database*):

Power – Baseline lamps [W] (*Contact Declaration/Visual check of spare baseline parts if still in stock*):

Power – LEDs installed [W] (*From database*):

\_\_\_\_\_

Power – LEDs installed [W] (*On-site validation*):

\_\_\_\_\_

Percent of the time when both lighting and cooling are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding cooling system number for each section (*Site validation/Contact declaration*):

\_\_\_\_\_

Percent of the time when both lighting and heating are ON in this section (*Contact declaration*):

\_\_\_\_\_

Indicate the corresponding heating system number for each section (*Site validation/Contact declaration*):

\_\_\_\_\_

Validate that the LEDs are still installed and not burnt. If some are burnt or missing, indicate how many:

\_\_\_\_\_

### New CFL Screw-in/Hardwire

When were the LEDs removed or when did they burn?

\_\_\_\_\_

Is the facility manager planning to have them replaced? If, not why?

\_\_\_\_\_

### New Occupancy sensor (OCC)

OCC Section 1

OCC Section 2

OCC Section 3

Is the equipment still used? If not, which percentage is operating? When did the change occur?

\_\_\_\_\_

Number – Occupancy sensor (*From database*):

\_\_\_\_\_

Number – Occupancy sensor installed (*On-site validation*):

\_\_\_\_\_

Type – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*From database*):

\_\_\_\_\_

Number – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*From database*):

\_\_\_\_\_

Wattage – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*From database*):

\_\_\_\_\_

Type – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*On-site validation*):

\_\_\_\_\_

Number – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*On-site validation*):

\_\_\_\_\_

### **New Occupancy sensor (OCC)**

Wattage – Lamps controlled by OCC; if several types are encountered per OCC, indicate each type (*On-site validation*):

\_\_\_\_\_

Daily operation hours before OCC  
(*From database, for each section*):

\_\_\_\_\_

Daily operation hours before OCC  
(*From database*):

Please fill the table below for each section with OCC



| Schedule # | Lighting schedule                               | Monday | Tuesday | Wed. | Thu. | Fri. | Sat. | Sun. | Holidays |
|------------|-------------------------------------------------|--------|---------|------|------|------|------|------|----------|
| 1          | Operating hours<br>(for example: 8:00 to 17:00) |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 2          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |
| 3          | Operating hours                                 |        |         |      |      |      |      |      |          |
|            | Hours per day                                   |        |         |      |      |      |      |      |          |

Hours of use per year with OCC (From database)

\_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding schedule number for each section:*

\_\_\_\_\_

Hours of use for equipment: *Indicate the corresponding annual hours:*

\_\_\_\_\_

Percent of the time when both lighting and cooling are ON in this section  
(Contact declaration):

\_\_\_\_\_

Indicate the corresponding cooling system number for each section (Site validation/Contact declaration):

|                                                                                                          |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Percent of the time when both lighting and heating are ON in this section<br>(Contact declaration):      |  |  |  |  |  |
| Indicate the corresponding heating system number for each section (Site validation/Contact declaration): |  |  |  |  |  |

## **5 SNAP BACK / SNAP FORWARD QUESTIONS**

For lighting systems:

Which of the following statements would you say most accurately describes your company's / organization's use of the new lighting that was installed through the Small Business Energy Solutions Program?

1. Use lights more than the lights that were replaced
2. Use lights less than the lights that were replaced
3. Use lights the same amount as the lights that were replaced
4. Use the lights more, but instead of other less efficient lights
9. (Don't know/Don't recall)

## **6 LIGHTING LOGGER INSTALLATION**

Data logger will be installed for each site visited, in several sections. This will allow monitoring the actual operation hours for the sections selected. Econoler will provide a list of sections to be monitored for each site. A protocol to install the logger and to retrieve the data collected on site is available at Appendix II.

Please indicate the total number of loggers  
installed at this site

Comments or notes

---

## APPENDIX VIII-1

Please refer to the table below for examples of codes to be used for lighting fixture, ballasts and lamps when collecting site data. Replace with the appropriate length and wattage when required.

|          | Product                          | Code to use in form    |
|----------|----------------------------------|------------------------|
| Fixtures | 8 FT fixture for 1 T12 lamp      | T12 – 8FT – 1L         |
|          | 4 FT fixture for 2 T12 lamps     | T12 – 4FT – 2L         |
| Ballast  | Electronic                       | ELE                    |
|          | Magnetic                         | MAG                    |
| Lamps    | CFL – Screw-in – 13W             | CFL – SI – 13W         |
|          | CFL – Hardwire – 42W             | CFL – HW – 42W         |
|          | CFL – Hardglass – PAR 20 – 40 W  | CFL – HG – PAR20 – 40W |
|          | High Pressure Sodium – 50 W      | HPS – 50W              |
|          | Metal Halide – 100 W             | MH – 100W              |
|          | 4 FT T8 lamp – 32W               | T8 – 4FT – 32W         |
|          | 4 FT T8 lamp – 32W – High Output | T8 – 4FT – HO          |

## APPENDIX VIII-2

### LIGHTING LOGGER INSTALLATION PROTOCOL

#### 1 SELECTION OF THE LOCATION FOR LOGGER INSTALLATION

Econoler will provide **Equilibrium** with a list of sections where a data logger should be installed for each site visit. Each section will be numbered to indicate its priority (from 1 to up to 11). A sufficient number of loggers will be installed in the first section, then in the second, etc. However, a maximum of 11 loggers is available per site. It shall be noted that only one logger should be installed for each section, unless lights are controlled by multiple light switches. In such an event, one logger should be installed for each sub-section controlled by a switch.

Each logger should be installed on a fixture that is representative of the section evaluated. Thus, no logger should be installed on permanently closed lights or exit signs.

#### 2 LOGGERS INSTALLATION

Before installing the logger, confirm that the site contact is OK with the lights been turned OFF and back ON once or twice in the section where the logger will be installed.

The following information is extracted from the Smart-wave operator's guide (also available in the SMARTware software Help Topics)

- 1 Set the logger's sensitivity level:

- You can adjust the *LIGHTINGlogger* for various ambient light conditions by turning the screw labeled "SENSITIVITY." The *LIGHTINGlogger* is sensing the lights when the display ON symbol is shown. Adjust the sensitivity using a small screwdriver so that, in the highest ambient light conditions and with the light to be monitored off, the logger is off (ON symbol is missing). The logger should then show the ON symbol when the monitored light is turned on. **9**

- Using a screwdriver to turn the sensitivity screw clockwise towards the "+" will make the LIGHTINGlogger more sensitive to light. **DO NOT OVERTURN! THE SCREW WILL ONLY TURN THROUGH ABOUT 270°.** Greater sensitivity allows it to be used in areas of low ambient light and will allow a dimmer light source to activate the LIGHTINGlogger. Making the LIGHTINGlogger less sensitive to light allows it to be used in areas of high ambient light without activating until the monitored light is turned on. **Verify that the logger symbol  is displayed when the monitored device is on, and that the symbol is blank when the monitored device is off.**

2 Reset the memory:

- If the data in memory are not part of the current experiment, insert a small screwdriver or paperclip into the hole labeled "RESET" and push and hold down the recessed button for approximately 2 seconds until the word "rESET" appears in the display. This will clear any data from the logger's memory. Be sure to do this after you have set the sensitivity.

**Note:** Holding the Reset button down for approximately five seconds will cause "CLEAR" to appear on the LCD and resets the internal date to 01/01/2001 and the time to 12:00 am. Be sure to set the time and date before starting a new logging session.

**TECH TIP:** This will clear all data from the logger memory. In the event this happens inadvertently, see the section "Special Functions" on page 14 to find out how to retrieve lost data.

- 3 Record the logger's location and serial in the data collection Excel File for easy data retrieval.
- 4 When the monitoring period is done, retrieve the logger and record the logger removal date on the back of the logger. Connect the logger to a computer to retrieve the data.

**Each logger installed must be identified using an indicator (sticker) on the fixture, especially if the logger is installed inside a fixture.**

### **3 DURATION OF TESTS**

Loggers should be installed for a minimum of 7 days, in order to capture lighting usage data for a complete week, and in a period reflecting normal business operation. Thus, no installation should be conducted on a business holiday or if the 7 days period includes a business holiday (for example, Thanksgiving). Furthermore, even if the metering period overlaps on more than 7 days, only data for a complete week with only 7 days should be reported.

## 4 DATA COLLECTION

Once the metering is complete, data must be retrieved from the logger using the Smart-ware software. This software allows data extraction in a CVS format as well as the recording of the entire data collection file (.log format) for a measurement campaign. For each data logger installed, data must be extracted and copied in a excel file (provided by Econoler), and the entire data collection file (.log format) must be saved. The name of each data collection file must be the site number in the sample provided by Econoler. Furthermore, each data collection file (.log format) must be assigned a name representing of the site location and the section where the measurement is conducted, using the format indicated in the data extraction section below. The following procedures, extracted from the SmartWare Operator's guide, must be used for data extraction and saving.

### Data Extraction:

- > Connect Lighting Logger to computer, using the USB Communication cable
- > Open the SmartWare 2009 software;
- > In the menu bar select: Logger; Retrieve Data...command to retrieve the data from the logger and save it to the computer hard drive:
  - A new window will appear, allowing the .log file to be saved. Save the file using the following format: *Site number\_SectionName\_Logger#InRoom.log* (for example: Site 1\_Office\_1.log);
  - Once the log file has been saved, the data will be displayed in a separate window. Select all the data in the window, and Copy.
  - In the data collection Excel file: paste the data copied in the appropriate cells.
- > When data extraction is complete, disconnect logger from the computer.
- > Repeat the previous action for each logger.

## APPENDIX IX - ALGORITHM FOR FREE-RIDERSHIP CALCULATION

The following algorithm describes the free-ridership calculation for the Small Business Energy Solutions Program. For each participant, four levels of program attribution are calculated based on the FR questions included in the survey and are then transposed into a final free-ridership level

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FR1.</b> Before participating in the program, did your company have plans to install the specific energy-efficient lighting products that were installed through the program?                                                                                                                                                                   | IF 1. Yes: Use FR1a<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                      |
| <b>FR1a.</b> I just want to make sure - <b>Before</b> you decided to participate in the program, you had already made the decision to install the energy-efficient lighting products?                                                                                                                                                              | IF 1. Yes: FR1 = 100%<br>IF 2 OR 9 : FR1 = 0%                                                                                                                                    |
| <b>FR2a.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient lighting products that you installed through the program? (Scale 0 to 10)                                                                                                                                       | FR2a = Answer x 10%                                                                                                                                                              |
| <b>FR2b.</b> In the absence of the program, what is the likelihood that you would have installed standard lighting products instead of energy-efficient lighting products? (Scale 0 to 10)                                                                                                                                                         | FR2b = (10 – Answer) x 10%                                                                                                                                                       |
| <b>PA1 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>MEAN VALUE OF:<br/>(FR2a ; FR2b)</b>                                                                                                                                          |
| <b>FR3.</b> If your company had not received the rebate offered by the program, would you have paid for the full cost of the project, including the portion covered by the rebate? (Scale 0 to 10)                                                                                                                                                 | FR3 = Answer x 10%                                                                                                                                                               |
| <b>PA2 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>IF FR1 = 0% : FR3 / 2<br/>IF FR1 = 100% : FR3</b>                                                                                                                             |
| <b>FR4.</b> Level of influence (Scale 0 to 10)<br>Factors a, b, c and h = Program factors<br>Factor f = Non Program factor                                                                                                                                                                                                                         | FR4_P = SUM(a ; b ; c ; h)<br>FR4_NP = f                                                                                                                                         |
| <b>PA3 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>100% -<br/>[FR4_P/(FR4_P+FR4_NP)]</b>                                                                                                                                         |
| <b>FR2c.</b> In the absence of the program, what is the likelihood that you would have installed exactly the same energy-efficient lighting products <b>but at a later date?</b> (Scale 0 to 10)                                                                                                                                                   | IF FR2c > 5 : ASK FR2cc<br>Otherwise: PA4 = EMPTY                                                                                                                                |
| <b>FR2cc.</b> Approximately how many months later would you have installed these products?<br>1. Less than 6 months?<br>2. 6 months to less than 1 year later?<br>3. 1 to less than 2 years later?<br>4. 2 to less than 3 years later?<br>5. 3 to less than 4 years later?<br>6. 4 or more years later?<br>7. (Never)<br>9. (Don't know / Refused) | IF 1. : FR2cc = 100%<br>IF 2. : FR2cc = 50%<br>IF 3. : FR2cc = 25%<br>IF 4. : FR2cc = 0%<br>IF 5. : FR2cc = 0%<br>IF 6. : FR2cc = 0%<br>IF 7. : FR2cc = 0%<br>IF 9. : FR2cc = 0% |
| <b>PA4 Score:</b>                                                                                                                                                                                                                                                                                                                                  | <b>FR2cc</b>                                                                                                                                                                     |
| <b>Final Free-Ridership</b>                                                                                                                                                                                                                                                                                                                        | <b>MEAN VALUE OF :<br/>(PA1 ; PA2 ; PA3 ; PA4)</b>                                                                                                                               |

Subsequently, the final free-ridership level calculated for each participant was submitted to two inconsistency tests:

- > The first inconsistency test consisted in verifying if  $(FR2a - FR2b) \geq 30\%$ . In that case, the participant's answers to FR2a and FR2b represented an inconsistency and PA1 became equal to the smallest value between FR2a and FR2b. Otherwise, PA1 remained unchanged. Moreover, if the adjusted PA1 value was still  $\geq 50\%$  for a participant who had declared deciding to install the energy-efficient lighting products after learning about the program, PA1 was re-adjusted to 0%.
- > The second inconsistency test consisted in verifying if  $FR3 \geq 70\%$  and if  $FR2a$  or  $FR2b < 70\%$ . In that case, the participant's answer to FR3 represented an inconsistency and PA2 was removed from the final free-ridership calculation. Otherwise, PA2 remained unchanged.

Finally, the average free-ridership level for the program corresponded to the weighted average of the final adjusted free-ridership levels calculated for each participant with the energy savings associated with each participant.





**ECONOLER**

# **DETAILED REVIEW OF COMPLETED ENERGY EFFICIENCY PROJECTS AT NEW PAGE, PORT HAWKESBURY**

**2011 EVALUATION REVIEW**

**EFFICIENCY NOVA SCOTIA CORPORATION**

Final Report

February 21, 2012



**ECONOLER**

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## **INTRODUCTION**

As part of the 2011 Efficiency Nova Scotia Corporation (ENSC) program evaluation, Econoler was requested to analyze and evaluate the energy and demand savings results from a measurement and verification (M&V) report produced by the firm EPS for New Page Port Hawkesbury paper mill in Nova Scotia.

The M&V report produced by EPS is titled "Detailed Review of Completed Energy Efficiency Projects at New Page, Port Hawkesbury," October 17, 2011.

## **1 M&V REPORT REVISION AND ANALYSIS**

Two reports were made available to the Evaluator. The first one, issued in March 2011, was a preliminary review of energy efficiency conducted at New Page mill. This report was based on a self-assessment of the project impact by the mill. The second report, which is the one considered by the Evaluator, was completed over the July to October 2011 period under a mandate from ENSC. This second report consisted of a detailed independent M&V evaluation of the energy and demand savings achieved through the energy efficiency project implemented at the mill. A final report was issued in October 2011.

The October 2011 report methodology adhered to the Superior Energy Performance (SEP) Measurement and Verification Protocol. This protocol is based on the best practices found in the International Performance Measurement and Verification Protocol (IPMVP), a recognized evaluation tool for individual energy efficiency projects. The SEP protocol also includes a specific requirement to conduct both a top-down and a bottom-up sanity check analysis that provides a higher level of confidence in the results than would a single approach.

According to the SEP procedure, the top-down approach should be used as the main source of savings while the bottom-up approach as a "sanity check" only.

Table 1 of the report is reproduced below. The top-down analysis concludes that energy savings of 154.2 GWh and demand savings of 17.8 MW are a result of the project. The top-down analysis found a savings that is 26 percent higher than the sanity check evaluation that resulted in estimated savings of 122 GWh. This difference was noted by the evaluation team and discussed with the EPS team and subsequently with the New Page representative during the interview that followed the report review.

**Table 1 : Summary of Results**

| #                              | Project Title                           | Project Start | Adjusted INITIAL REPORT estimate |              | Bottom-up estimate based on statistical energy analysis |             | Top-down Estimate |             |
|--------------------------------|-----------------------------------------|---------------|----------------------------------|--------------|---------------------------------------------------------|-------------|-------------------|-------------|
|                                |                                         |               | GWh                              | MW           | GWh                                                     | MW          | GWh               | MW          |
| 1                              | Upgrade Line 1 Refiner*                 | 2010          | 63.9                             | 7.3          | 53.4                                                    | 6.1         | -                 | -           |
| 2                              | Optimize Line 3 Production**            | Mid 2008      | 9.8                              | 1.1          | 59.6                                                    | 6.8         | -                 | -           |
| 3                              | Optimize Rejects Screening**            | Sep 2009      | 16.8                             | 2.0          |                                                         |             | -                 | -           |
| 4                              | Bypass Noss Cleaners (Not completed)*** | Sep 2011      | 11.30                            | 1.35         | N/A                                                     | N/A         | -                 | -           |
| 5                              | PM2 Vacuum Blower Power Reduction       | Late 2009     | 12.60                            | 1.5          | 9.04                                                    | 1.03        | -                 | -           |
| <b>TOTAL (incl. project 4)</b> |                                         |               | <b>114.4</b>                     | <b>13.25</b> | -                                                       | -           | -                 | -           |
| <b>TOTAL (excl. project 4)</b> |                                         |               | <b>103.1</b>                     | <b>11.9</b>  | <b>122.0</b>                                            | <b>13.9</b> | <b>154.2</b>      | <b>17.8</b> |

The analysis was conducted for projects implemented over a period ranging from June 2007 to August 2011. The baseline period was June 2007 to June 2008 (13 months). The post-implementation period started in July 2008 with the completion of the first measure. The period where the measures were partially implemented was called the middle period and it spanned from July 2008 to June 2010 (two years). The period from July 2010 to August 2011 (14 months) was the follow-up period. One measure was still not completed at the time of EPS report finalization in October 2011. The savings from this measure that was planned for completion in December 2011 were thus not included in the present analysis.

The analysis was done using a multi-variable regression model with a normalization of plant output.

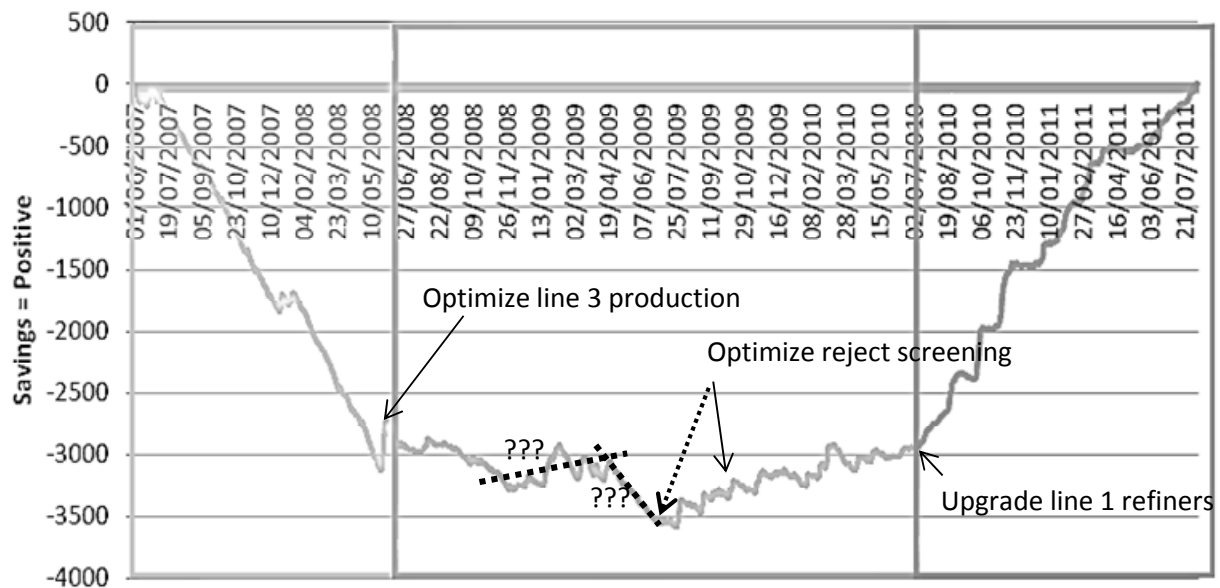
The regression analysis was performed on an Excel sheet (using the add-on module for multi-regression) and the calculation has been reviewed by the Evaluator. In accordance with a normalized approach, different statistical models have been produced for the baseline period and for the period with measures implemented. Two files were produced, one for the total plant usage and another for the paper machines only. The files include the raw data received with a large number of potential variables that can affect energy usage in the plant (coming from the plant process logging system). The same file included various analyses showing the different combinations of variables tested before selecting a final statistical model. Variables showing a low level of correlation (P-Factor, t as the main indicator) were eliminated gradually leaving a small number of variables explaining the energy variation in the plant. This approach is consistent with statistical analysis methods normally used for such analysis. The methodology of the experts having performed the analysis is clear from the file and

the final model is logically derived from the various analyses. The analyses included an initial assessment with a large number of variables followed by several more specific analyses, an outlier analysis, a detailed analysis of pulp freeness (a pulp quality), an analysis of refining energy impact on total plant energy usage, an evaluation of the temperature on the paper machine and thermomechanical pulping (TMP) operations. All these analyses were performed with different statistical hypotheses, including free floating intercept and forced zero intercept.

The statistical analyses performed are state-of-the-art and well done and the Evaluator has no concerns with the work performed by EPS.

The figure below presents one of the analyses in the EPS report that provides an overview of the TMP energy over the analysis period. This type of CUSUM analysis over the total analysis period of four years is quite useful in determining the inflexion point in trends that usually correspond to major energy usage reductions or modifications. The arrows and remarks were added by the Evaluator to highlight some points that needed discussion with the EPS experts and the New Page plant representative. The left section of the figure clearly shows that the baseline energy trend is a downward slope that is generally stable. The optimization of line 3 of the TMP shows a clear change in energy usage. The Evaluator had questions about the trend at the end of 2008 and the beginning of 2009 that showed improvements and a subsequent deterioration of the plant energy usage. The date of implementation of the reject screening measure was also a point discussed as the CUSUM showed a clear improvement in energy usage some months before the "official" implementation date of the measure. The right section of the figure starts immediately after the completion of the larger measure which is the TMP line 1 improvement.

**Figure 1: CUSUM Analysis for TMP Energy Usage**



The final model resulting from the statistical analysis included three different regression models: one for the baseline, one for the middle period (some measures implemented) and one for the follow-up period (all measures implemented).

The following variables were retained for the final model:

- > paper production;
- > TMP pulp production;
- > % of TMP pulp used in the finished paper vs. purchased Kraft pulp and clay;
- > temperature (only affecting paper machine energy).

The calculation for the readjusted baseline, the middle and the follow-up period models were normalized at 1,400 tons per day of production, 10°C external temperature (only used for the paper machine, not for the TMP that is independent of temperature). All the calculations adhere to the IPMVP normalized savings calculation.

The top-down total mill electricity linear regression equations developed for the baseline period and the two reporting periods are as follows:

**Baseline (year 1)**

NPPH Total electric load (MW) = Paper Production (tons/d) \* 0.048 + TMP production (admt/d) \* 0.090 + Temp (°K) \* 0.022;

**Middle Period (year 2-3)**

NPPH Total electric load (MW) = Paper Production (tons/d) \* 0.048 + TMP production (admt/d) \* 0.090 + Temp (°K) \* 0.022;

**Follow-up Period (year 4)**

NPPH Total electric load (MW) = Paper Production (MT/d) \* 0.049 + TMP production (admt/d) \* 0.059 + Temp (°K) \* 0.122.

These equations all have a statistical fit of over 0.99 (R<sup>2</sup>) indicating a very close correlation between the final plant energy and the TMP production, paper output and temperature. Further analysis of the “importance factor” and the P-factor statistics all showed a strong correlation for each independent variable.

These equations combined with the normalized condition for plant production and temperature resulted in final savings of 154.2 GWh and 17.8 MW.



## **2 FOLLOW UP INVESTIGATION**

Upon reviewing the report, a series of questions on elements not covered specifically in the report and that could have affected the energy usage of the plant were identified. Telephone conferences with the EPS expert involved in report preparation were conducted to gather additional information as a means to complement the report. Finally, Mr. Mark Frith, responsible for this project at New Page Industry, was interviewed to clarify the remaining questions about the report produced.

One of the elements verified during these interviews was the reasons that could explain the final results of the top-down approach being 26 percent higher than the energy and demand savings expected from the summation of the individual measures (bottom-up).

### **2.1 EXAMINATION OF FEEDSTOCK AND FINISHED PRODUCT CHARACTERISTICS**

The Evaluator was interested in determining whether some factors not considered in the statistical analysis could have caused a reduction in the energy usage of the plant even in the absence of any energy efficiency projects. The following sections describe the main inquiries that were analysed during interviews.

#### **Feedstock Material Variation**

Raw material characteristics are mandatory variables that must be analyzed while preparing the adjusted baseline mathematical model (Section 3.4.1 of the SEP M&V protocol). This verification should be done to avoid concluding that energy changes caused by variations in raw materials are interpreted as energy savings. Those kinds of raw material variations are completely independent of the energy efficiency project implemented and can produce “artificial” savings in a top-down billing analysis. The Evaluator noted that there was no discussion in the EPS report about those factors and this should have been included.

During the interview, the EPS technical expert explained that to the best of his knowledge, the type of species of woods used as feedstock for the plant as well as the collection area in Nova Scotia were similar throughout the analysis period. He mentioned that there was no detailed record in the plant about the species and tonnage received and that the procedure used in the wood yard to pile the raw material and use different piles as sources during the TMP production was impossible to follow precisely. The plant tried for years to implement a more precise follow-up of raw material variation but it was not practical.

He also mentioned that there was no mass metering at the entry of the TMP and that all tonnage processed had to be estimated on the basis of the speed of the alimentation screw to the system. The

exact density of the raw material is not measured by the plant and this could cause instantaneous divergence of as much as 10 percent in the mass evaluation. However, over the long term, the overall figure will balance if the species used and geographical collection areas remain constant year after year. The quantity of paper produced is the most precise information available about plant throughput as this is the final product sold. The raw material density variation is an operational reality of paper plants and there is no reliable and affordable solution to density variation measurement on a continuous basis.

Subsequent interviews with the New Page representative confirmed that the source and species of wood were similar from year to year during the analysis period. All feedstocks are sourced in Nova Scotia with a significant portion from Cape Breton Island. Fir and Spruce are the two main species harvested as feedstock. There are some seasonal variations but the pattern repeats every year. For instance, there is more spruce used as raw material in winter while the summer period has a larger percentage of balsam fir. The mass measurement estimate using feed screw speed was also discussed. Mr. Frith agreed that it was the best indication available for the volumetric quantity of raw material entering the TMP lines. The density variation in the feed material definitely affects the short-term evaluation of mass but for an analysis conducted over a span of several years with the same type of raw material used each year, this will on average provide an accurate result.

After discussion with both the EPS and New Page representative, the Evaluator concluded that the variation in raw material followed a repetitive profile over the years and it was correct to assume that there was no substantial energy usage variation caused by feedstocks over the analysis period.

### **Type of Finished Product**

The SEP protocol does not mention specifically that characteristics of the final product should be considered in an impact evaluation. However, it is obvious that variations in finished product type could have an impact on energy usage which would not be the result of the energy efficiency project implemented. Those changes in finished product type were not included in the statistical analysis performed by EPS. Only the mass of finished products was considered as an independent variable together with outside air temperature. No discussion was included in the EPS report about other factors related to the type of final product that may have caused energy intensity reductions. Some of the most important factors for the pulp and paper industry (raw materials and type of products) are well known and identified on the OEE website.

- “TMP refining energy is affected by wood species; common Canadian species such as pine require more energy than black spruce. Refining energy is also sensitive to paper grade, with higher-quality mechanical printing paper grades requiring higher energy. Though there are new

processes for reducing refining energy somewhat, consistent industrial performance has not yet been achieved.”<sup>1</sup>

To determine if variations of finished paper products could have affected the energy usage of the plant even in the absence of an energy efficiency project (the baseline), the EPS technical expert and the New Page representative were interviewed separately on this specific aspect of the analysis.

During the interview, the EPS expert confirmed that indeed the final product type had been reviewed during his mandate even if this had not been discussed in the final report. He confirmed that the plant produces two types of paper. One of the two paper machines produces newsprint paper while the other produces a higher quality Supercalendered (SC) paper. The production from year to year was fairly constant over the analysis period. Detailed information about the type of paper produced each day was just available for the period starting in August 2009, which was not sufficient to factor the paper type into the statistical analysis conducted because detailed information was not available for the baseline.

The discussion with Mr. Frith of New Page confirmed that there was no large deviation in the finished product over the analysis period. The grade of paper produced was stable over this period. There was a change in the TMP pulp recipe where the sulfur content was changed in order to improve the finished product brightness. The fresnel analysis led by EPS was performed specifically to check this parameter but found that it was non-significant in relation to energy usage.

The interview conducted confirmed that the paper grade produced did not change significantly over the analysis period and it was thus reasonable not to include this parameter in the statistical analysis to determine the top-down energy savings. The only parameter that did change was the sulfur content and the fresnel analysis performed confirmed that it was not a significant factor for energy consumption. The Evaluator thus concludes that the product type had likely no effect on the impact calculated using the top-down approach.

## **2.2 OTHER HYPOTHESES TO EXPLAIN THE HIGHER SAVINGS ACHIEVED**

Several reasons could have explained the higher energy and demand savings achieved over what was expected initially during the energy efficiency project feasibility study. Those various elements were discussed with the EPS technical expert and the New Page plant representative to see if they could potentially explain the large additional savings identified.

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<sup>1</sup><http://oee.nrcan.gc.ca/publications/infosource/pub/cipec/pulp-paper-industry/section-03.cfm?attr=20>

Those include:

### **Larger TMP Production Compared to Paper Output**

One of the effects of the energy efficiency project was the production of a better quality pulp and in larger quantity. For the normalized output of 1,400 tons/day of paper, a quantity of 1,238 ADMT/day for pulp production was achieved which was more than during the baseline period. This increase in local production of pulp has displaced the purchase of external pulp and also resulted in a readjusted baseline that was significantly higher. This shift in internal production of pulp to displace external purchases was not envisioned initially during project design and can thus explain a portion of the energy savings identified.

### **Optimization of TMP Line Operation**

After implementation of the Line #1 project and subsequent testing, it was confirmed that line #1 was more efficient than Line #3, which was also renovated. Line #2 was the least efficient unit after the renovation. Mr. Frith confirmed that after February 2010, where Line #1 was put in operation, the plant had made significant efforts to optimize the operation of the three lines by using in priority Line #1 followed by Line #2. Operation of Line #3 was significantly reduced. This shift in distribution of loading between lines was not an element included in the initial savings calculation for the project and thus is not included in the bottom-up analysis, which was an update of the March preliminary report. Mr. Frith estimates that this element is likely the element responsible for the significant increase in performance observed in the whole plant energy usage analysis.

### **Measure No. 5**

Another possibility for the additional savings found is linked to measure No. 5 as the Evaluator found a mention on page 11 of the report that measure 5 savings are based on a conservative estimate. It is expected that the reduction in vacuum blower pressure will have an impact on the electrical drive providing motive power to the mill roll. As a result, this measure could have generated more savings but there is not enough information to quantify the contribution of this measure to the additional savings found. But there is likely an effect.

### 3 CONCLUSION

The Evaluator concludes that the savings evaluated in the report titled “**Detailed Review of Completed Energy Efficiency Projects at New Page, Port Hawkesbury,**” issued on October 17, 2011 by the firm EPS, are a fair representation of the savings generated by the energy efficiency projects at the New Page, Port Hawkesbury plant.

The Evaluator concludes that some elements like feedstock and characteristics of finished products should have been discussed in the report. However, further discussions with EPS experts and plant representatives lead to the conclusion that these factors likely had only a small influence on the energy usage of the plant.

The difference between the top-down approach and the bottom-up approach is relatively high at 26 percent but there are several elements that were not included in the bottom-up approach and that can explain the difference in savings calculated. Among those is the optimization of the operation of the most efficient line and the increased quantity of TMP pulp produced internally at the plant. The utilization of the top-down savings vs. the bottom-up savings approach adheres to the SEP protocol for plant energy savings evaluation.

The Evaluator concludes that annual energy savings of 154 GWh and demand savings of 17.8 MW are a fair representation of the energy efficiency projects.

**Table 2 : Top-Down Estimate (October 2011)**

| GWh   | MW   |
|-------|------|
| 154.2 | 17.8 |



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