

**NOVA SCOTIA'S 2010
ELECTRICITY DEMAND SIDE MANAGEMENT PLAN
EVALUATION REPORTS**

FINAL REPORT

FEBRUARY 28, 2011

Submitted to:
NOVA SCOTIA UTILITY AND REVIEW BOARD

Submitted by:
EFFICIENCY NOVA SCOTIA CORPORATION

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Evaluation of 2010 DSM Programs Executive Summary

February 26, 2011

Final Report

**Submitted to:
Efficiency Nova Scotia Corporation**

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Evaluation of 2010 DSM Programs Executive Summary

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Executive Summary

1 DSM Portfolio Performance

1.1 Overview

This document provides a summary of the evaluation of 2010 electric Demand Side Management programs in Nova Scotia. NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

For the 2010 program year, the NMR team conducted impact and process evaluations of the following programs:

- Efficient Products Retail (PD),
- Efficient Products Appliance Retirement and Replacement (ARR),
- EnerGuide for Existing Houses (EEH),
- Low Income Households (LIH).
- New Houses (NH), and
- Efficient Lighting Products Direct Install (DI),
- Smart Lighting Choices (SLC),
- Business Energy Rebates program (BER),
- Commercial and Industrial Custom (C&I),
- Small Business Lighting Solutions (SBLS),

It is the opinion of the NMR team that the portfolio of programs evaluated in 2010 was generally run well and efficiently. The 2010 targets were met despite ramped up savings goals and operational challenges at a time when program staff were carrying out their work while also transitioning to Efficiency Nova Scotia Corporation.

The DSM plan for 2010 was approved by the Utility and Review Board (UARB) on August 4, 2009. Table 1-1 presents the approved savings targets and the evaluated results for the 2010 program year.

**Table 1-1: 2010 UARB Approved Savings Targets and NMR Results
(Net Installed Annual Energy and Demand Savings at the Generator)**

DSM PROGRAM	2010 Targets Per PDWG, Jan 26, 2010 ¹		2010 Total Results - NMR Evaluation	
	GWh	MW	GWh	MW
RESIDENTIAL PROGRAMS				
Efficient Products Residential*	5.00	1.05	12.65	2.71
EnerGuide for Existing Houses	4.93	1.41	8.14	2.17
Low Income Households	5.26	1.17	0.90	0.20
New Houses	2.00	0.64	0.68	0.81
RESIDENTIAL TOTAL	17.19	4.27	22.37	5.89
C&I PROGRAMS				
Efficient Products - Direct Install	19.96	3.24	25.23	5.29
Smart Lighting Choices	10.00	2.42	6.25	1.19
Business Energy Rebates**			0.50	.07
C&I Custom**	20.00	3.41	19.41	2.41
Small Business Lighting Solutions	13.98	3.30	11.21	1.53
C&I TOTAL	63.94	12.37	62.60	10.49
PORTFOLIO TOTAL	81.13	16.63	84.97	16.38

* Includes the Power Down (Retail) and Appliance Retirement and Replacement program components.

** Includes Retrofit and New Construction

1.2 Discussion

The savings achieved by the DSM Administrator's portfolio of conservation programs exceeded 2010 program energy savings targets by 5% or a total of 3.84 GWh; they also virtually met demand savings targets, achieving 98% of the target. The achievement of the portfolio energy savings target came through exceeding some individual program goals, coming close to some, and falling short on others.

The Efficient Products -Residential program exceeded its 2010 program target by 153%, or 7.6 GWh; within the Efficient Products Retail program, the Compact Fluorescent Lamp (CFL) markdown component accounted for 72% of the program's energy savings. The Efficient Products Direct Install program exceeded its 2010 program target by 26%, or 5.3 GWh. The EnerGuide for Existing Houses program exceeded its 2010 program target by 65%, or 3.2 GWh. Specific observations regarding each of these programs are provided below.

¹ Program Development Working Group (PDWG)

- In 2010, the CFL component of the Efficient Products – Retail program accounted for 88% of the program's energy savings from retail product sales. As a result of the upcoming phase-out of incandescent bulbs starting in January 2012, the CFL component will soon reach the limits of its value for securing energy savings. It appears that it will be difficult for the program to promote other retail products that provide the energy savings derived from the CFLs.
- The Efficient Products Direct Install program continues to perform strongly and customers continue to be happy with the program. However, as with the CFL component of the Efficient Products – Retail program, it is also faced with the upcoming phase-out of incandescent bulbs and the CFL component reaching the limits of its value for securing energy savings for the program. Additionally, program staff is of the opinion that the savings from this individual program may have peaked in 2010.
- In March, 2010 Natural Resources Canada (NRCan) announced that new participants in the EnerGuide for Existing Houses program would not be eligible for federal rebates, which led to a misperception among customers and potential participants that the program had ended. Despite this challenge, the program exceeded targets by 65%. Nonetheless, the program is faced with uncertainty about whether or not it will continue past March 31st 2011.

The other programs having specific energy savings targets were not able to achieve those targets. These programs include the Low Income Households program, which fell short of its program target by 83%, or 4.4 GWh; the Business Energy Rebates/Smart Lighting Choices programs, which fell short of their program target by 33%, or 3.3 GWh; the Small Business Lighting Solutions program, which fell short of its program target by 20%, or 2.8 GWh; and the New Houses program, which fell short of its program target by 66%, or 1.3 GWh. The C&I Custom program nearly achieved its program target, falling short by only 3%, or 0.6 GWh. Specific observations regarding each of these programs are provided below:

- The Low Income Households program has historically been challenged in the recruitment of eligible participants and, despite notable efforts in 2010 to diversify recruitment sources, continues to struggle with this limitation.
- The BER program was a new program in the portfolio, and given the time required to build awareness and generate interest in a new program, it is reasonable to expect that the impact of the BER program will be greater in 2011.
- The SLC program appears to have performed well in 2010. However, the province is expected to enact legislation in the future mandating that all T8 lighting sold in Nova Scotia be High Performance (HP) T8 lighting. This legislation will render the SLC program in its present form superfluous.
- Despite falling short of goals in 2010, the net energy impacts of the Small Business Lighting Solutions program have increased steadily since 2008. In 2010, the expansion of the program from two pilot regions to the entire province appears to have had no negative effect on customer satisfaction.
- The 2010 Nova Scotia building code raised energy efficiency standards to a minimum EnerGuide rating of 80. The New Houses program can enhance savings by setting significant stretch goals for participants, who now are able to exceed the program's threshold EnerGuide rating of 83 and be eligible to receive incentives simply by installing a heat pump.

1.3 Program Data Tracking

It is important to note that the 2010 evaluation encountered significant bottlenecks stemming from data issues in several programs. The data tracking issues fell into two primary categories:

1. Data Quality Issues: Inconsistent, inaccurate, or missing data
2. Data Access / Delivery Issues: Inability to generate regular participation reports in a reasonable time frame

While not all programs were affected by these difficulties, the underlying problems raise concerns about the systems for entering and tracking program data in general. Equally importantly, it will be critical for Efficiency Nova Scotia to take early steps to prevent such problems because they will become magnified when the new organization scales up to meet more ambitious savings goals.

1.3.1 Data Quality Issues

The NMR team encountered several issues involving inconsistent, inaccurate, or missing data in 2010. These issues were experienced particularly in the SBLS, DI, and C&I Custom programs.

Inconsistent and Inaccurate Data

The NMR team identified data entry errors due to human error in the C&I Custom tracking system for three sites. The errors varied across the sites. Since these errors varied, the tracking system deficiencies were clearly not systemic but the result of human errors or inconsistencies in data entry.

During the on-site visits for the DI impact evaluation, NMR identified numerous discrepancies between the number of installed bulbs as recorded in the tracking system and the number installations observed on-site. These discrepancies were brought to the attention of the Program Administrator who reviewed them with the implementation vendors. Further investigation by the implementation vendors revealed that these discrepancies stemmed from two sources: 1) inaccurate reporting of installations, and 2) installers leaving behind bulbs for later installation by customer staff themselves. The DSM Administrator and the implementation vendors took immediate corrective action to address these issues. Further details on corrective actions and the effect on the evaluation can be found in the DI evaluation report.

While the problems with the DI data tracking system were resolved, they indicate the potential for such errors in other programs in the DSM Administrator's portfolio. Programs that are implemented through Delivery Agents or subcontractors who are reimbursed or paid based on the quantity of measures or type of equipment installed are particularly vulnerable to these types of errors. The following programs would especially benefit from additional spot audits or site inspections by program staff for a sample of participants: SBLS, LIH, and DI.² The DSM Administrator should consider devoting resources to conduct spot audits or site inspections, on a quarterly basis, on a sample of program participants. If problems or issues are discovered, the DSM Administrator should increase the number of audits or inspections until the problems or issues are resolved.

² NMR understands that the DSM Administrator has already implemented a protocol with increased frequency of site inspections for 2011.

Missing Data

After reviewing the results from a range of analyses based on SBLS participant billing data, it was determined that the participant data did not include all accounts for each participant. That is, some of the treated sites had multiple meters that were affected by the program but were not included with the billing data provided. According to the program manager, when customers with multiple meters (accounts) participate in the SBLS program at multiple locations, only one account number is recorded in the designated database field, while other account numbers are described in an associated notes field for each project. While this does not affect the tracking of equipment installed, it makes conducting a billing analysis problematic. We recommend that this be taken into consideration when tracking participants.

1.3.2 Data Access / Delivery Issues

The evaluation was hindered by the excessive time required to generate reports detailing participation (several months) and by the inconsistencies, inaccuracies and errors present in the reports once they were generated.

The inability to generate regular, sufficiently accurate participation reports in a reasonable time frame was especially problematic for the suite of programs administered by Conserve Nova Scotia—New and Existing Houses, and Low Income Households. In addition to the limitations imposed on data sharing for these programs by confidentiality concerns, the data provided for these programs did not follow a consistent format either across or within program years. This was especially problematic when evaluating the LIH program, for which substantial time was required to identify the measures installed at each home. In addition, despite a recommendation in the 2009 evaluation, the LIH program has not implemented a unique identifier for data tracking purposes. This not only creates difficulties for evaluation activities, but also introduces an area of potential confusion for program staff.

To a lesser extent, generating reports for other programs including the SBLS, BER, and C&I Custom programs appeared to take significant effort on the part of program staff, in some cases requiring several days before requests could be fulfilled.³ These delays were especially problematic for generating monthly participation lists required by NMR to complete telephone surveys.

1.3.3 Recommendations

Data tracking and reporting are crucial tools for program management and they provide the foundation for evaluation activities. The DSM Administrator understands the importance of a good data tracking system and implemented a centralized data tracking system in the summer of 2010. While all 2010 projects were integrated into the new centralized data system, additional work remains to fine-tune the system. NMR understands that implementing a centralized data tracking system takes time and that DSM Administrator staff will need to fine-tune the system over time. The 2010 evaluation shows the clear need for improved data tracking, especially in regard to data entry, reporting, and specifying the data tracked.

³ Part of this was due to program staff allocating resources to the transition of programs to the new Efficiency Nova Scotia Corporation, concurrent with this evaluation.

The DSM Administrator should examine their data tracking processes and procedures for each program and consider the following recommendations regarding data tracking:

- Establish clear protocols and standards for entering and tracking program data and document them in program manuals. Also make sure that all relevant staff members are thoroughly trained on these protocols and standards.
- Implement reporting protocols that allow program managers to generate participation reports quickly and efficiently. Such reports are required for the effective evaluation of program performance and the proper management of programs.
- Enhance audit or site inspection protocols for each of the programs in its portfolio for specific programs. In particular, prioritize the Efficient Products Direct Install, Small Business Lighting Solutions and Low Income Homes programs for audits or site inspections,
- Ensure that evaluators are aware that SBLS sites may have multiple meters.

Furthermore, as detailed in NMR's 2009 Best Practices Study of Data Tracking Systems, the DSM Administrator should seek to:

- Ensure that the tracking system supports the requirements of all major users, including program administrators, managers, contractors, evaluators, customers, and end-users.
- Automate, as much as practical, routine functions (e.g. monthly portfolio and program reports).
- If possible, incorporate data likely to be needed for project assessments (such as historical billing data) into the data tracking system.

1.4 Looking Ahead to 2011

As Efficiency Nova Scotia looks ahead to 2011, NMR thought it important to gain perspective on the programs based on the evaluations conducted over the previous three years. Table 1-2 shows the evaluated contribution of each program to total portfolio savings between 2008 and 2010. In all three years, the commercial and industrial sectors accounted for over two-thirds of total portfolio energy and demand savings. Thus, residential programs accounted for less than one-third of total portfolio energy and demand savings.

- In 2008, 72% of total portfolio energy savings and 73% of demand savings came from the commercial and industrial sectors.
- In 2009, 82% of total portfolio energy savings and 78% of demand savings came from the commercial and industrial sectors.
- In 2010, 74% of total portfolio energy savings and 65% of demand savings came from the commercial and industrial sectors.

As the portfolio moves forward, it is important to recognize that in 2008, 2009 and 2010, it relied heavily on the performance of Efficient Products Direct Install and the Efficient Products Residential CFLs to achieve savings goals (Table 1-2). These two programs have accounted for more than 50% of all portfolio energy and demand savings since 2008. However, as already noted, these programs are faced with the upcoming phase-out of incandescent bulbs starting in January 2012.⁴ Thus, the CFL portions of these programs will reach the limits of their value for securing energy savings over the course of 2011 and

⁴ <http://oee.nrcan-rncan.gc.ca/regulations/bulletin/general-service-lamps-dec08.cfm?attr=4>

2012. Anticipating this, the DSM Administrator has taken steps to diversify their portfolio of programs with the addition of several new programs and launching of pilot projects in 2009 and 2010. However, the DSM Administrator has as yet been unable to identify another strong performer to replace the EP-DI or EP-PD programs.

Table 1-2: Program Performance as Percent of Total Portfolio

Program	Percent of Portfolio Savings 2008		Percent of Portfolio Savings 2009		Percent of Portfolio Savings 2010		Percent of Portfolio Savings 2008 through 2010	
	Energy	Demand	Energy	Demand	Energy	Demand	Energy	Demand
EP-DI	35%	34%	50%	51%	30%	32%	38%	39%
C&I Custom	30	27	15	11	23	14	21	15
SBLs	7	11	7	8	13	9	10	9
EP- PD (Retail)	28	27	10	15	12	14	13	16
EEH	--	--	5	5	10	13	7	8
SLC	--	--	9	8	7	7	7	7
ARR	--	--	--	--	3	3	1	2
LIH	--	--	3	3	1	2	2	2
NH	--	--	<1	<1	1	5	1	3
BER	--	--	--	--	1	<1	<1	<1

In summary, the portfolio has relied heavily on deriving savings from the commercial sector and, until now, the DSM Administrator has not been able to establish a solid foothold in the residential sector, aside from the Efficient Products Retail CFLs, which may be reaching the end of their program life-cycle. Seeking to expand their offerings to residential customers, the DSM Administrator added two new residential programs in 2009 and expanded the Efficient Products Retail program in 2010 to include additional measures. The new programs included EEH, NH and ARR.⁵ NMR is of the opinion that, of these programs, EEH and ARR will likely offer the best opportunities for providing notable energy savings in 2011.

As a new organization, Efficiency Nova Scotia, will likely find it a challenge to achieve its 2011 energy savings goals which have nearly doubled to 158.5 GWh, given expected organizational growth challenges, coupled with diminishing savings from two historical mainstays of the portfolio (Efficient Products Direct Install and Efficient Products Retail CFLs). Finally, as a new organization, charged with a mission of implementing electric DSM programs in the province, Efficiency Nova Scotia has an opportunity to create relationships anew, not only with customers, but with stakeholders and interest groups.⁶

⁵ The Appliance Retirement and Replacement (ARR) program was treated as a component of the Efficient Products program but was, in many respects, different from the other program components, which were focused on rebating products sold at the retail store level.

⁶ The prior relationships between Nova Scotia Power, the previous administrator for most of the DSM programs, and some stakeholders or interest groups may have been affected by the perception of the company as a for-profit entity in the business of selling electricity.

2 Evaluation Objectives & Methodology

2.1 Evaluation Objectives

The principal objectives of the evaluation were as follows:

- Document program objectives and processes
- Develop independent estimates of energy and demand savings for each program
- Identify opportunities for improving program performance

2.2 Impact Evaluations

The impact evaluations integrated findings from the phone surveys and program data to generate program-level impacts through statistical techniques. The C&I Custom, SLC, BER, and ELP DI impact evaluations included on-site visits and data collection. The EEH, NH and LIH evaluations drew upon HOT2000 base house reports and upgrade house reports, as well as impact reports and other secondary sources. For all programs except the LIH program, a net-to-gross ratio was calculated that incorporated impacts of free ridership and, in some cases, spillover. The net-to-gross ratio was applied to the gross savings impacts in order to estimate net savings impacts for each program.⁷

2.2.1 On-site Evaluations

In total, the NMR team visited 55 participant sites—13 C&I Custom participant sites (28% of 47 completed projects), 9 SLC participant sites (<1% of over 5,000 estimated projects),⁸ eleven BER participant sites (85% of 13 completed projects),⁹ and 22 DI participant sites (<1% of 5,447 completed projects). The objective of the site visits was to collect participant data to enable the performance of all necessary engineering analyses to inform estimates of each program's gross energy and demand savings. The complete results of all site work are provided in the individual program reports.

2.2.2 Net-to-Gross Ratio and Net Impacts

For each program, aside from LIH, NMR calculated a net-to-gross ratio, based on estimates of free ridership and, in some cases, spillover. NMR relied on survey results to estimate free ridership and spillover. The net-to-gross ratios for each program are presented in Table 2-1. Additional detail on the methods employed in the determination of net-to-gross ratios and net impacts for each program can be found in the individual program reports.

Including the three subcomponents of the Efficient Products Retail program (CFLs, Fixtures & Controls, and Appliance Retirement & Replacement), NMR evaluated a total of 11 programs. Five of these eleven programs showed relatively low levels of free ridership—Efficient Products –Retail: CFLs, LIH, C&I

⁷ Free ridership and spillover were not calculated for the LIH program.

⁸ Note that the SLC program is administered at the distribution level and therefore it is difficult to estimate the total number of unique projects. However, based on a review of program tracking data, NMR estimates that the program had over 5,000 completed projects in 2010.

⁹ Note that the NMR team called the other two sites to further verify and refine savings based upon information gathered over the phone.

Custom, SBLS, and SLC.¹⁰ Low levels of free ridership indicate that the DSM programs have been effective in attracting customers who would not have taken actions without the influence of the DSM Administrator programs. Programs that had relatively high levels of free-ridership included: Efficient Products –Retail: Fixtures, Controls & Appliances, New Houses, and Business Energy Rebates.

For the Efficient Products –Retail program component, measures included ENERGY STAR indoor light fixtures, programmable thermostats, indoor light timers, heavy duty outdoor/pool timers, dimmer switches, power bars with timers, ENERGY STAR refrigerators, and ENERGY STAR clothes washers. These were products that typically are purchased only as needed—unlike light bulbs, they do not frequently fail, have longer life spans, and users are not likely to keep a stock of them for later use. Thus, most of program sales of these products were in effect to free-riders who were planning to purchase them anyway, regardless of the presence or absence of the program.

The fixtures and controls resemble CFLs in that they are relatively low-cost items that can help save energy. However, unlike light bulbs, fixtures and controls don't easily burn out, have longer life spans, and users are not likely to keep a stock of them for later use. Hence they are purchased less frequently and typically only as needed. Similarly, refrigerators and clothes washers are infrequently purchased items, not only because of their long life spans but also because of their high costs.

In the case of the New Houses program, the 2010 Nova Scotia building code raised energy efficiency standards to a minimum EnerGuide rating of 80—this was the original program participation threshold which was raised to EnerGuide 83 in the fall of 2010. However, even the new minimum requirement of EnerGuide 83 did not set significant stretch goals for participants, who could exceed this rating simply by installing a heat pump.

The Business Energy Rebates program was a new program focused on prescriptive measures. Higher levels of free-ridership are more common with prescriptive programs which process a high volume of small transactions.

Table 2-1: 2010 Energy & Demand Net-to-Gross Ratios

Program	Net-to-Gross Ratio
Efficient Products –Retail: CFLs	133%
Efficient Products –Retail: Fixtures, Controls & Appliances	44%
Efficient Products –Retail: Appliance Retirement & Replacement	74%
Low Income Households	100%
EnerGuide for Existing Houses	76%
New Houses	46%
C&I Custom	90%
Efficient Products - Direct Install	77%
Small Business Lighting Solutions	87%
Smart Lighting Choices	84%
Business Energy Rebates	54%

¹⁰ The Efficient Products –Retail: CFLs estimated a net-to-gross ratio using a difference-of-differences approach and was presumed to have had spillover. Free ridership was not calculated for the LIH program which is free to low income participants.

2.3 Process Evaluations

The process evaluations rely on multiple research tasks including a review of program documents, in-depth interviews with program staff and contractors, surveys of participants and non-participants, and visits to a sample of sites.

2.3.1 In-depth Interviews

The evaluation methodology included in-depth interviews with program staff, contractors and other stakeholders. Between June 2010 and January 2011, NMR staff conducted 39 in-depth interviews with various stakeholders including: Program Staff, Delivery Agents, Contractors and Participants. These included 12 interviews with Program Staff, 15 interview with a Delivery Agents, eight interviews with Contractors, and four in-depth interviews with program participants. A summary of the interviews completed for each program is presented in Table 2-2.

Table 2-2: 2010 Process Evaluation In-Depth Interviews

Program	In-Depth Interviews Completed 2010			
	Program Staff	Delivery Agents	Contractors	Participants
C&I Custom	1	--	--	1
SBLS	1	3	2	1
DI	1	1	1	--
EP – PD	1	1	1	--
EP – ARR	1	1	4	1
SLC	--	--	--	--
EEH	2	4	--	--
NH	1	1	--	--
LIH	2	4	--	--
BER	1	--	--	1
Overall Marketing	1	--	--	--
Total	12	15	8	4

2.3.2 Telephone Surveys

NMR completed a total of 548 interviews with 2010 program participants and 70 interviews with non-participants (Table 2-3). Although the content of the surveys varied greatly, the survey instruments generally were used to capture information such as satisfaction with the program and measures installed, verification of actions recorded in program tracking databases, free-ridership, spillover, participant and non-participant motivations and barriers, and recommendations for program improvements. The surveys were conducted by NMR's subcontractor, Interviewing Service of America, out of its offices in Halifax, NS. The interviews were conducted between August 2010 and January 2011 utilizing computer-assisted telephone interviewing (CATI). The Efficient Lighting Products Retail Markdown Program (PD) and the EnerGuide Existing Houses Program utilized random digit dial (RDD) samples of residential telephone numbers in Nova Scotia and the remaining programs utilized contact information provided by the DSM Administrator.¹¹

Table 2-3: 2010 Process Evaluation Telephone Surveys

Program	Surveys Completed 2010	
	Participant	Non-Participant
C&I Custom	13	--
SBLS	65	--
EP RM/PD	133	70
EP DI	77	--
EP ARR	70	--
SLC	--	--
EEH	70	--
NH	47	--
LIH	62	--
BER	11	--
Total	548	70

¹¹ The NH survey utilized an RDD sample for the non-participant survey.

3 Individual Program Performance

Based on the evaluation activities described above, it is the opinion of the NMR team, that the portfolio of programs evaluated in 2010, generally were run well and efficiently. That said, to help achieve the substantially larger 2011 portfolio energy savings goals,¹² the DSM Administrator needs to boost participation rates and/or savings per participant and implement additional programs to help diversify savings as some programs reach the end of their program life-cycles. Brief overviews of NMR's evaluation for each program are presented below, complete evaluation findings can be found in the individual program reports.

3.1 C&I Custom Program (C&I)

The C&I Custom program is a well run program with a well-documented and detailed data tracking process, rigorous policies and procedures to screen out free-riders, and a rigorous monitoring and verification (M&V) approach to its tracking savings estimation work.

The evaluated impacts of the C&I program in 2010 indicate that the program was a strong performer in 2010. In addition, it is noteworthy that the 2010 energy savings exceeded the sum total of the previous two years (2008 and 2009), indicating strong growth of the program in 2010. However, while the C&I Custom program came close to achieving its one-year energy savings goal it fell short of reaching its demand target. As energy savings were close to targets but demand savings were not, NMR recommends that the DSM Administrator may want to consider adapting the program design to permit incentives for demand response, load shifting or other demand-related initiatives.

In an effort to increase program participation and increase program savings, in 2010, the DSM Administrator started promoting the program more actively through the use of a new position 'Sales Lead' that identifies and recruits participants for the program. The resulting higher savings indicated that efforts to increase participation and savings were successful in 2010. Based on the success of the Sales Lead in 2010, the DSM Administrator hired a second Sales Lead in 2011 to prepare for higher program goals. It should be noted that, due to the scale and complexity of projects, C&I Custom projects can have long implementation schedules (up to three years). Therefore, the impacts of successful sales activity in any given year may not be fully realized in that year. Given the increasing goals of the C&I Custom program, outreach and marketing will become correspondingly more important to achieving those goals. The DSM Administrator should continue to work with the Sales Leads as well as encourage contractors to promote the program to their customers.

¹² Portfolio energy savings goals were 81.13 GWh in 2010 and will be 158.5 GWh in 2011.

3.2 Prescriptive Rebate Programs

3.2.1 Business Energy Rebates Program (BER)

The BER program was a new program in the portfolio for 2010 and was launched on June 28th, 2010. Targeted at C&I customers, 13 customers participated in the BER program and received an incentive from the DSM Administrator in 2010. Given the time required to build awareness and generate interest in a new program, it is expected that the impact of the BER program will be perceived more fully in 2011. There are signs that businesses in Nova Scotia are interested in a program that offers incentives for energy efficient equipment. All of the participants interviewed as part of the 2010 evaluation said that managing and reducing energy costs were important to their business and the majority of respondents were satisfied with the program.

Notwithstanding the high levels of satisfaction, the DSM Administrator should work with participants, contractors, and other stakeholders to improve incentive levels and develop a rational incentive structure—the only source of concern about the program expressed by some participants. In addition, the DSM Administrator should work with participants to help secure additional energy savings from their businesses.

3.2.2 Smart Lighting Choices (SLC)

For the 2010 SLC program, NMR focused on measuring the impacts only, since any effort to improve the program through a process evaluation would have been of limited value as the SLC program will be terminated once the expected legislation mandating T8 lighting is enacted.

3.3 Small Business Direct Install Lighting Program (SBLS)

Despite falling short of goals in 2010, the net energy impacts of the SBLS program have increased steadily since 2008. They more than tripled from 2008 to 2009 and more than doubled again in 2010. The SBLS program continued to perform well with high levels of customer satisfaction and relatively low levels of free-ridership, although free-ridership increased relative to 2008 and 2009.

In 2009, NMR recommended that the program closely monitor the performance of Delivery Agents, Electrical Contractors and the Materials Vendor to ensure that it continued to maintain high levels of customer satisfaction and installation quality. In 2010, the expansion of the program appears to have had no negative effect on customer satisfaction.

Notwithstanding the high levels of customer satisfaction, issues with material orders and deliveries were mentioned by program staff, Delivery Agents, and the Materials Vendor. In light of these issues and concerns, the DSM Administrator decided to move away from a single source Materials Vendor in 2011. Under this alternate program design, instead of Delivery Agents using a sole source Materials Vendor, Delivery Agents are responsible for obtaining their own materials and adhering to a maximum price constraint for work completed. The NMR team believes that this approach may alleviate some concerns for Delivery Agents and allow the program to continue to grow and operate without constraints imposed by materials delivery issues. With the implementation of this alternative program design it will become increasingly important for the DSM Administrator to monitor the performance of Delivery Agents in order to achieve 2011 targets and to ensure continued high levels of customer service.

3.4 Efficient Products – Retail Program (Power Down - PD)

Despite strong performance in 2010, the CFL component of the PD program is faced with the upcoming phase-out of general service incandescent bulbs starting in January 2012.¹³ Thus, the CFL program component will reach the limits of its value for securing energy savings over the course of 2011 and 2012. In anticipation of this eventuality, in 2010, the PD program sought to diversify its sources for achieving energy efficiency goals by expanding the range of energy efficiency measures that it incentivized to include light fixtures, various controls, and appliances.

In 2010, the CFL program component continued to account for the bulk of the energy savings (71% of gross energy savings and 88% of net energy savings) from retail product sales in the Power Down program. Additionally, the track record for sales of the other retail products seems to support the profile of infrequent purchase behaviors associated with their previously described characteristics. Thus, it appears that it will be extremely difficult for the PD program to have these other retail products provide the level of energy savings that were derived from CFLs.

3.4.1 CFL Component

CFL sales through the PD program continued to increase in 2010. Notably, there was a significantly higher incidence of program participants in 2010 (31%) than in 2009 (17%). Actual sales data on program purchases revealed an increase from 155,222 CFLs in 2008 and 117,005 CFLs in 2009 to 179,591 CFLs in 2010, and the Power Down program greatly exceeded 2010 sales goals of 65,000 CFLs. Reflecting the DSM Administrator's anticipation that the CFL program component will reach the limits of its value in the near future and the desire to diversify energy savings, the goals for the CFL portion of the PD program declined significantly compared to the 2009 Retail Markdown Program, from 186,990 total CFLs to 65,000 total CFLs, a decline of 65%.

3.4.2 Fixtures and Controls Components

Based on the survey of retail store managers, a large portion of sales of fixtures and controls would have happened in the absence of the PD program. As noted previously, this may be due to the characteristics of fixtures and controls as products that are typically purchased only if needed. The PD program should consider focusing instead on new construction and major renovation projects for promoting fixtures and controls such as programmable thermostats and dimmers.

3.4.3 Appliance Rebates Component

As with fixtures and controls, retailers interviewed reported that the majority of refrigerator and clothes washer sales would likely have taken place in the absence of the program. Given the high levels of free-ridership found in 2010, it may be necessary for the program to target even higher levels of efficiency in any future appliance rebate programs. The Consortium for Energy Efficiency (CEE) Super-Efficient Home Appliance Initiative (SEHA) has established performance tiers for appliances. By rebating appliances rated as Tier 3, the DSM Administrator could reduce free-ridership rates and increase gross energy savings per unit. In addition, the DSM Administrator could offer packaged rebates that offer incentives only when consumers purchase multiple energy efficient appliances.

¹³ <http://oee.nrcan-mncan.gc.ca/regulations/bulletin/general-service-lamps-dec08.cfm?attr=4>

3.5 Efficient Products – Direct Install Program (DI)

The DI program continues to perform strongly and customers continue to be happy with the program. The CFL and LED free-ridership rates remained statistically similar among 2008, 2009 and 2010. However, as in 2009, there were indications in 2010 that customers were beginning to act on their knowledge of CFLs and install them on their own, which could result in increased free-ridership levels for CFLs in the future. In 2010, nearly seven out of ten (69%) respondents said they were aware of the benefits of CFLs. Nearly all of the respondents who were aware of the benefits of CFLs (94%) reported having purchased them previously for their businesses. In addition, based on self-reported socket saturations, four out of five 2010 respondents had at least one CFL installed in their business prior to participating in the DI program and over two out of five (45%) said that 25% or more of their screw-based sockets contained CFLs prior to participating in the DI program. In contrast, only two out of five 2010 respondents said they had had at least one LED exit light installed prior to program participation. Based on these findings, it may be advisable to reconsider the incentives and design of the program in the future. One possible approach might be to require customers to pay for a portion of the cost for the energy efficiency measures offered by the program and to continue to offer installation services for free.

3.6 EnerGuide for Existing Houses Program (EEH)

In March, 2010 NRCAN announced that new participants would not be eligible for federal rebates, which coincided closely with the announcement of the transition of administration of the DSM programs from Nova Scotia Power to Efficiency Nova Scotia Corporation. This led to misperception among customers and potential participants that the program had ended. In addition, the program is faced with uncertainty about whether or not it will continue past March 31st 2011. As a result of all of these program issues and concerns, most of the Delivery Agents had to lay off staff and therefore the EEH program delivery infrastructure has been affected. Notwithstanding these issues, the program substantially exceeded its energy and demand savings goals.

In the 2009 evaluation, NMR had remarked on the planned exit of NRCAN from the program on March 31st, 2011. NMR had commented on the importance of the Delivery Agents and that, regardless of the future of the EEH program, the DSM Administrator should consider reinforcing its relationship with the Delivery Agents. NMR noted that the Delivery Agents were a program asset that the DSM Administrator needed to nurture in the interest of maintaining an infrastructure to promote energy efficiency in the province. NRCAN's withdrawal of rebates from the program (for future participants) precipitated events that may require the DSM Administrator to regain the trust and confidence of Delivery Agents and to rebuild the program delivery infrastructure. It is important that the DSM Administrator work to overcome these barriers as a cursory review of statistics from NRCAN suggest that there are substantial opportunities for an existing home retrofit program such as EEH.

3.7 New Houses Program (NH)

While NH program participation was much higher in 2010 than in 2009, the 2010 NH program itself had relatively less influence on energy efficiency because the 2010 Nova Scotia building code had raised energy efficiency standards to a minimum EnerGuide rating of 80, improving new home energy efficiency and making it easier for builders and owners to participate and receive incentives through the NH program.

Even with the new minimum requirement of EnerGuide 83, the program did not set significant stretch goals for participants, who could exceed this rating simply by installing a heat pump. Indeed, one of the Delivery Agents remarked that most participants were motivated to participate primarily by the heat pump incentives. An analysis of the 2010 program tracking database revealed that three out of five 2010 participants who had achieved an EnerGuide rating of 83 or higher had installed a heat pump. This suggests that for many new home builders, participation in the NH program may have in fact been driven largely by an interest in receiving incentives for installing a heat pump. Furthermore, the program also had high levels of free-ridership—79% for builders and 52% for homeowners. Thus, at first glance the NH program may have been mostly a heat pump program. That said, survey respondents reported strong interest in energy efficiency and satisfaction with the program.

3.8 Appliance Retirement and Replacement Programs (ARR)

3.8.1 Appliance Retirement

There clearly is substantial demand for an appliance retirement program in Nova Scotia. This was reflected in the fact that, in spite of relatively high free ridership levels, the pilot was able to achieve its savings goals. Additionally, responding to public demand, the DSM Administrator felt it necessary to extend the pilot into a second phase. The design of any future program needs to address a number of issues including screening free riders, revising incentive structures, timing of promotions, and careful attention to planning and communications.

3.8.2 Appliance Replacement

The replacement component of the ARR program was the DSM Administrator's first foray into the multi-family market. The multi-family market is widely considered to be "hard-to-reach" and this was reflected in experience gained through this pilot in Nova Scotia. The difficulty in reaching the multi-family market may have been compounded by the fact that, as a pilot program, the resources of the appliance replacement program were necessarily limited. Marketing and outreach activities focused on cold calls and meetings with a few property managers. In addition, the limited term of the pilot program made it difficult to synchronize with the longer planning cycle of the multi-family sector, which typically operates on set annual budgets with predetermined allowances for planned replacements of equipment such as refrigerators.

Despite the difficulties involved with working with the multi-family sector, this is a market that offers substantial energy savings opportunities. NMR recommends that the DSM Administrator continue to move forward with the Appliance Replacement Program and use it as an opportunity to gain a foothold in the multi-family sector. As the program establishes itself, it will provide opportunities to deepen relationships with multi-family landlords, property owners and managers which, in turn, can provide an opening for other future programs that may focus on the multi-family sector. Pursuant to developing

program offerings for the multi-family sector, the DSM Administrator should seek to gain a better understanding of this market in Nova Scotia. In particular, the DSM Administrator should keep in mind that split incentives can be a significant barrier to energy efficiency improvements in the multi-family sector.

3.9 Low Income Households (LIH)

The LIH program uses three primary REAP Delivery Agents who implement the program. Each Delivery Agent employs or subcontracts with Energy Advisors who are certified to perform on-site energy audits and obtain EnerGuide ratings for each home. The DSM Administrator, Conserve Nova Scotia (CNS) program manager, and the Delivery Agents interviewed thought that the program delivery process generally runs smoothly. The large majority of respondents (90%) to the participant survey were satisfied with the program overall. Three out of five survey respondents (61%) reported improved comfort levels in their homes and two out of five (40%) reported that the program measures had reduced their energy bills (40%). Although spillover effects were not quantified in this evaluation, three out of five respondents (60%) reported behavior changes such as turning off lights and lowering thermostat levels and almost one-half reported increased knowledge of energy efficiency (46%). This evaluation identified opportunities to improve program design, marketing and communications. For additional detail please see the individual program evaluation report.

4 Key Findings and Recommendations

This section provides a summary of the key findings and recommendations for each of the programs. Table 4-1 presents summary findings and recommendations organized by program as well as comparative findings and recommendations for the portfolio of programs. Note that in the findings and recommendations for the individual programs (Findings C&I-F1 through ARR-F16 and Recommendations C&I-R1 through ARR-R16), the numbering corresponds to numbering in the individual reports. Further detail on a particular finding or recommendation may thus be found in the same finding or recommendation number in the associated individual report.

Table 4-1: Key Findings and Recommendations

Program	Finding	Recommendation
Commercial and Industrial Custom Program	C&I-F1. The C&I Custom program incorporated checks to ensure that participants would not proceed with project implementation unless funding was provided by the DSM Administrator. In 2008, 2009, and 2010 NMR found consistently low, but increasing, levels of free-ridership for the C&I Custom program. At this time NMR is not concerned with the level of free-ridership present in the program but if it continues to increase it may become an area of concern.	C&I-R1. The DSM Administrator should continue to include free-ridership checks as part of the C&I Custom program and should consider including similar checks in any other programs developed for the commercial and industrial sectors. The DSM Administrator should continue to monitor free-ridership as part of the C&I program and if free ridership levels continue to rise, consider adjusting the screening procedures used to identify free-riders.
	C&I-F2. Due to the compressed time frame between the end of the program year and the submission of the evaluation report, the C&I Custom program had a compressed timeframe to perform M&V activities related to 2010 projects and to incorporate those results into their tracking system. This was also the case in the 2009 evaluation.	C&I-R2. The NMR team suggests that the C&I Custom program consider moving to a non-calendar year evaluation schedule. The DSM Administrator should consider creating a program year that allows program staff sufficient time to complete their M&V activities and enter the results into the tracking system. After that, a more rigorous impact evaluation effort can be undertaken for the program.
	C&I-F3. In 2010, the evaluation process experienced significant bottlenecks due to the time required to generate simple reports detailing completed projects and data entry errors identified in the tracking system for sites in the 2010 sample. Since these errors varied, the tracking system deficiencies were not systemic but the result of errors or inconsistencies in data entry.	C&I-R3. The Program Administrator needs to more rigorously review their tracking database and ensure that all staff members using the database follow consistent data entry protocols.

Program	Finding	Recommendation
Commercial and Industrial Custom Program	C&I-F4. In contrast to 2008 and 2009, relatively few 2010 respondents reported that they had first heard of the C&I Custom program from a contractor or vendor. However, as in 2009, the majority of 2010 respondents said that someone from outside their organizations was most responsible for specifying the measures installed.	C&I-R4. Conduct training sessions with energy efficiency contractors and design professionals that will educate them on the C&I Custom program. Also work with them to develop marketing tools that they can utilize with customers. Training contractors can be a strong marketing channel for the C&I Custom program, helping to reach those customers who are currently unaware of the program.
	C&I-F5. Program marketing and outreach activities such as the addition of a Sales Lead and print advertising successfully helped increase 2010 program participation and savings. Program staff indicated that contractors could be a particularly effective outreach channel. More than four out of five 2010 respondents (85%) reported that someone outside their organizations was most responsible for specifying the measures that were installed through the C&I Custom program—design professionals (46%) and contractors (23%) were cited most often.	C&I-R5. In 2011, the C&I custom program should build on its 2010 program marketing and outreach activities. Contractors and design professionals represent channels that may be effectively utilized to promote the program.
	C&I-F6. As in 2008 and 2009, customers in the 2010 program were motivated to participate in the C&I Custom program primarily because of a financial benefit—77% were motivated by energy savings or costs, eight percent were motivated by savings on maintenance costs, and eight percent were motivated by the incentives.	C&I-R6. Continue to focus on the financial benefits of the program when working with customers and training contractors.
	C&I-F7. As in 2008 and 2009, relatively few 2010 survey respondents (31%) reported barriers to participation. The barriers reported were varied and customer specific.	C&I-R7. Continue to work with customers on a case-by-case basis and provide assistance as they work through the program.

Program	Finding	Recommendation
Commercial and Industrial Custom Program	C&I-F8. In 2008 and 2009, the vast majority of respondents were satisfied with the program overall (91% and 100%, respectively). In addition, the majority of respondents were satisfied with each aspect of the program. In 2010, respondents reported relatively lower levels of satisfaction with the program. Less than one-half of respondents said they were satisfied with their interaction and communications with program staff (47%) and contractors or consultants (33%), or with the list of available consultants (45%).	C&I-R8. The DSM Administrator should review their customer service processes and ensure that they continue to offer a high level of customer service as part of the C&I Custom program.

Program	Finding	Recommendation
Small Business Lighting Solutions Program	SBLS-F1. In 2010, the SBLS program formally added a Recycling Contractor responsible for collecting and recycling lamps and ballasts throughout the province. While the program had a Recycling Contractor in 2009, the process was much improved in 2010. In fact, in the 2009 evaluation, NMR recommended that, “As the SBLS program expands and begins to offer services in additional regions, the DSM Administrator should ensure that adequate recycling services are available.” In 2010, the DSM Administrator took this to heart and instead of requiring Delivery Agents to box and ship lamps from outlying areas, the Recycling Contractor was able to schedule pickups throughout the province, an improvement according to the Delivery Agents.	SBLS-R1. The SBLS program should continue to require that all materials removed during lighting retrofits be properly recycled and maintain a mechanism for accomplishing this.
	SBLS-F2. Despite the expansion of the SBLS program in 2010, the program still relied heavily on word-of-mouth, contractors, vendors and NSPI staff to recruit participants. When respondents to the participant survey were asked how they had first become aware of the SBLS program, more than one-half (55%) cited word of mouth (23%) or trade allies (22%)—electricians, contractors or vendors.	SBLS-R2. The DSM Administrator should consider providing participants and trade allies with ‘leave behinds’ that they can provide to interested customers. One possibility may be to provide them with SBLS business cards that contain the contact information for the Delivery Agent in their region.

Program	Finding	Recommendation
Small Business Lighting Solutions Program	SBLS-F3. Customers were motivated to participate in the program primarily to save on energy costs/bills—71% of 2010 survey respondents reported saving on energy costs/bills as their primary motivation and 18% reported saving on energy costs/bills as their secondary motivation.	SBLS-R3. The DSM Administrator should continue to promote the financial benefit of program participation to small businesses.
	SBLS-F4. As in 2008, the 2010 SBLS program encountered materials delivery issues. Delivery Agents estimated that anywhere between 60% and 80% of all deliveries were late or incorrect. Despite the implementation of a ‘Customer Continuous Improvement Quality Action Plan’ by the Materials Vendor in mid-2010, the Delivery Agents reported continuing materials delivery issues during in-depth interviews in August 2010. Whether the delivery issues existed at the level reported by the Delivery Agents or had been resolved as reported by the Materials Vendor was unclear. Despite this, the DSM Administrator has implemented an alternative program design that would eliminate issues in the future. Under this alternate program design, instead of Delivery Agents using a sole source Materials Vendor subject to price constraints, Delivery Agents are responsible for obtaining their own materials and adhering to a maximum price constraint for work completed. This alternate program design allows Delivery Agents to choose their own source of lighting materials and allows them to competitively shop for Materials Vendors that can meet their price and customer service requirements.	SBLS-R4. NMR recommends that the DSM Administrator carefully monitor the implementation of the alternative program design to ensure continued high levels of customer service. The DSM Administrator should also consider developing and instituting minimum criteria for reliability and materials quality for Materials Vendors chosen by Delivery Agents.
	SBLS-F5. Some respondents cited barriers to implementing additional energy efficiency measures (beyond those covered by the program) including lack of additional recommended measures (20%), lack of financing (16%), lack of information (11%) and lack of time (9%). In addition, spillover was relatively low among participants.	SBLS-R5. At the time of participant contact, the DSM Administrator should continue to provide additional information or direct customers to other sources of information for identifying other energy efficiency measures they can implement.

Program	Finding	Recommendation
Small Business Lighting Solutions Program	SBLS-F6. About one-half of the 2010 respondents (54%) said they had purchased some type of energy efficient lighting product prior to participating in the SBLS program. However, the majority of these purchases consisted of CFLs (71%) or LED exit lights (11%). In addition, while nearly two out of five respondents (37%) said they had had plans to pursue lighting improvements, their responses to a series of questions designed to estimate free-ridership indicated relatively low levels of free-ridership (13%) for the program. This indicated that, while SBLS participants were aware of lighting energy efficiency improvement opportunities, they were unlikely to take action without the assistance of the SBLS program.	SBLS-R6. The SBLS program is a crucial source of information, assistance and funding for participants. The DSM Administrator should continue to offer the SBLS program to small businesses.
	SBLS-F7. While nearly all of the 2010 respondents (63 out of 65) said they would be likely to purchase energy efficient equipment when replacing equipment in the future, fewer than three in ten respondents (29%) reported that participation in the SBLS program had influenced them to take additional actions on their own. When asked why they have not pursued additional measures, nearly one-half (49%) of respondents said that they did not know of additional measures (20%), were unable to provide a reason (18%) or lacked information about additional measures (11%). In addition, nearly all of the 2010 respondents said that reducing energy usage (97%) and managing energy costs (96%) were important to their businesses.	SBLS-R7. Despite the importance of reducing and managing energy costs to participants and their receptivity to purchasing energy efficient equipment, relatively few respondents reported taking additional actions after participating in the SBLS program. The DSM Administrator should consider expanding program offerings to help small business customers identify and pursue other energy efficiency measures.

Program	Finding	Recommendation
Efficient Lighting Products Direct Install	DI-F1. While around one out of four respondents in 2008, 2009 and 2010 (23%, 25% and 27%) reported having first learned about the DI program from a phone call from a subcontractor, in 2010, more than one out of five respondents said they had first heard about the DI program from an email (21%), significantly more than in 2008 (1%) or 2009 (<1%). This sharp increase in email awareness demonstrated that email could be an effective method for notifying customers about the program.	DI-R1. The DSM Administrator should consider using email to contact customers for programs like the DI program. Email is a cheap and effective method for informing customers about a program like this.
	DI-F2. Customers were motivated to participate in the program primarily because of a financial benefit—79% were motivated by saving on energy costs/bills and 5% were motivated by the program incentive. Note that the program did not offer any monetary incentives, the energy efficient measure as well as the installation were provided for free to the participant.	DI-R2. Continue to promote the financial benefit of program participation to small businesses, emphasizing energy savings.
	DI-F3. As in 2008 and 2009, the majority of 2010 respondents (97%) reported no prior participation in DSM Administrator run energy efficiency programs.	DI-R3. Since the majority of DI program participants have not participated in an energy efficiency program before, it is crucial that the DI program have a positive effect on participants. Otherwise, participants may be reluctant to participate in other energy efficiency programs in the future. The DSM administrator should consider providing customers with updates, perhaps through email, of the energy and cost savings they are experiencing due to participation in DI program.

Program	Finding	Recommendation
Efficient Lighting Products Direct Install	DI-F4. In 2010, respondents cited lack of time as the number one barrier to pursuing additional energy efficiency (25%). In addition, two out of five respondents were unable to provide a reason that they had not pursued additional energy efficiency measures. This may indicate that respondents didn't have the time to research energy efficiency and, if they were aware of additional measures, they did not have the time to implement them.	DI-R4. At the time of participant contact, provide additional information or direct participants to other sources of information for identifying other energy efficiency measures they could implement. With the expansion of the SBLS (Small Business Lighting Solutions) program to the entire province, DI installation teams should continue to be prepared to provide region-specific contact information for SBLS delivery agents.
	DI-F5. Some respondents cited lack of available financing (18%) as a barrier to implementing additional energy efficiency measures.	DI-R5. Current or future program administrators may want to consider a program to offer financing for additional energy efficiency measures, possibly in collaboration with local banks.
	DI-F6. Nearly seven out of ten 2010 respondents (69%) reported that they were aware of the benefits of CFLs; about two out of five (44%) reported that they were aware of the benefits of LED exit lights. Slightly more than one in four respondents (26%) reported having had plans to install CFLs or LEDs prior to participating in the DI program. Additionally, four out of five 2010 respondents said they had had at least one CFL installed in their business prior to participating in the DI program and over two out of five (45%) said that 25% or more of their screw-based sockets had contained CFLs prior to participating in the DI program.	DI-R6. Consider adjusting incentive levels for CFLs. This may, for example, include free installation services, but the businesses would have to pay for the cost of the CFLs. They may be further attracted to the proposition if the Administrator negotiates with the supplier to obtain favorable prices for the CFLs.

Program	Finding	Recommendation
Efficient Lighting Products Direct Install	DI-F7. According to self-reported data, even after participating in the DI program, there is significant potential among participants to install additional CFLs. While 2010 respondents reported that the DI program had installed CFLs in 50% of their screw-based sockets, they also said that, on average, 20% of their screw-based sockets did not contain CFLs even after participating in the program. In addition, nearly one in five respondents (19%) said that fewer than 50% of their sockets contained CFLs after participating in the program.	DI-R7. The DSM Administrator should make an effort to install CFLs in all (100%) available screw-based sockets when visiting customers the first time.
	DI-F8. About two out of five respondents (44%) reported that they had been aware of the benefits of LED exit lights prior to participating in the DI program—similar to 2008 and 2009. Fewer than one in twenty respondents (4%) reported actually having purchased LED exit lights prior to participating in the program. Overall, very few (6%) participants had planned to install LEDs prior to program participation and few (3%) reported having actually installed additional LEDs after participating in the DI program.	DI-R8. Given the unchanged awareness levels and additional installation plans post program of LED exit lights, this program component should continue to be promoted actively.
	DI-F9. According to self-reported data, even after participating in the DI program there remains significant potential among participants to install LED exit lights. While 2010 participants reported that 34% of their LED exit signs were retrofitted they also reported, on average, that 30% of their exit signs did not contain LEDs. In addition, nearly three out of ten respondents (27%) said that even after participating in the DI program none of their exit signs contained LEDs.	DI-R9. The DSM Administrator should make an effort to install LEDs in all (100%) of available exit lights when visiting customers the first time.
	DI-F10. Practically all of the respondents (97%) were satisfied with the program overall and more than four out of five respondents (85%) were ‘very satisfied.’	DI-R10. The Administrator of the program should continue to offer the DI program.

Program	Finding	Recommendation
Business Energy Rebate Program	BER-F1. Unlike the C&I Custom program, the BER program did not incorporate any checks to ensure that participants do not proceed with program implementation in the absence of funding from the DSM Administrator. In 2008, 2009, and 2010, NMR found consistently low levels of free-ridership for the C&I Custom program. In 2010, NMR found fairly high levels of free-ridership for the BER program (46%).	BER-R1. While higher levels of free-ridership may be acceptable for a new program that is seeking to gain traction in the market, as the BER program matures, the DSM Administrator should consider including a similar free-ridership screening process for the BER program. The DSM Administrator could limit these checks to larger projects by requiring them only on equipment over \$2,000 in cost. In keeping with the nature of the BER program, the free-ridership screening should be limited to a simple form that customers can fill out with project specific information.
	BER-F2. Nearly all of the respondents (10 out of 11) said that someone outside their organizations had been responsible for specifying the measures that were installed through the BER program. In addition, seven out of the eleven respondents said that a contractor (5) or a design professional (2) had been responsible for specifying equipment installed.	BER-R2. In 2011, the BER program should continue to build awareness and reach with customers. Contractors and design professionals represent channels that may be effectively utilized to promote the program.
	BER-F3. Customers were motivated to participate in the BER program primarily because of a financial benefit—nine said energy savings was their primary (6) or secondary (3) motivation and an additional three respondents said that the program incentive was their secondary motivation. In addition, saving on energy bills was the most frequently cited reason for installing energy efficient equipment. Three out of the four respondents who installed energy efficient lighting, both respondents who installed new motors/variable speed drives, and all three respondents who installed HVAC equipment reported this as their most important motivation	BER-R3. When working with customers and training contractors, focus on the energy and bill savings opportunities offered by installation of the program measures.

Program	Finding	Recommendation
Business Energy Rebate Program	BER-F4. The BER program was designed to be a streamlined prescriptive program. Not surprisingly, nearly all the respondents (ten out of eleven) experienced no barriers while participating in the BER program. The one respondent who reported facing a barrier said that it had taken too long to find out if they were eligible to participate.	BER-R4. The BER should continue to work with customers to avoid creating barriers to program participation. Given the prescriptive and streamlined nature of the program, the DSM Administrator should consider assigning sufficient resources to respond to customer inquiries; and, when appropriate, to elevate customers quickly to the C&I Custom program if their projects appear to be too complex to be quickly approved.
	BER-F5. The majority of respondents were satisfied with the program. On a scale from one (“not at all satisfied”) to five (“very satisfied”), eight out of the eleven respondents gave a rating of four or five to the program overall, while the other three respondents gave the program a rating of three. With the sole exception of rebate amounts, the other specific aspects of the program each received high satisfaction ratings from the majority of respondents.	BER-R5. As the BER program gains traction in the market and grows, it should be careful to maintain its standards for customer service and responsiveness while scaling up operations.
	BER-F6. Despite high levels of satisfaction, respondents were least satisfied with rebate amounts offered by the program. In addition, in an in-depth interview with a BER participant, the participant said, <i>“The challenge with [the BER program is that] the program is fairly new. Some of the rebates don’t accurately depict or give you enough incentives to implement the application or the product.”</i>	BER-R6. The need to make adjustments in incentives is not an unexpected obstacle in the inaugural year of a new program. In the in-depth interviews, the program manager brought up incentives as a potential obstacle for the 2010 program year and said that incentive levels may require adjustments over time based on feedback from participants and other factors. The DSM Administrator should examine the scope for increasing rebate amounts, taking into consideration cost-effectiveness as well as input from customers, contractors, and vendors.

Program	Finding	Recommendation
Business Energy Rebate Program	BER-F7. All of the respondents said that managing and reducing energy costs were important to their business and ten out of eleven said they were ‘very important.’ Despite the importance of managing and reducing energy usage and costs, none of the respondents reported having participated in any DSM Administrator sponsored rebate programs prior to the BER program and relatively few respondents reported taking any additional energy efficient actions after participating in the program.	BER-R7. BER participants appear to be a group of customers highly motivated to reduce energy usage and costs but have not been taking action. After participants complete projects through the BER program, the DSM Administrator should take the opportunity to help them identify additional projects to manage their energy usage and reduce costs.

Program	Finding	Recommendation
New Houses Program	NH-F1. Implementation of the NH program entailed multiple phases and a variety of people were involved in delivering the program. Furthermore, even with the new minimum requirement of EnerGuide 83, many homes could achieve this rating simply by installing a heat pump. Thus, as noted previously, the NH program effectively appears to have become a heat pump program	NH-R1. Under these circumstances, the program has two choices for its future direction. It should consider raising the minimum EG level to 85. This would help provide further separation from the NS building code and limit free-riders. In addition, the program should consider an incremental ratcheting up of participation requirements to an EnerGuide rating of 90 in two to three years. Alternatively, the program should consider exiting from the EnerGuide rating system and provide incentives directly for specific measures. The latter approach could potentially make for a more cost-effective and administratively efficient program.
	NH-F2. Starting in January 2010, Nova Scotia building code required all new homes to have a minimum EnerGuide rating of 80. Builders or homeowners had to either have their homes’ performance tested to show a rating of an EnerGuide 80 or higher or adhere to a set of prescriptive measures provided in the new building code. Building inspectors play a key role in enforcing the new energy efficiency requirements and are key stakeholders for any future residential new construction programs.	NH-R2. Before designing any future residential new construction energy efficiency programs, the DSM Administrator should work with building inspectors to understand the training they receive and their experience with enforcing building code. Building inspectors may have valuable insights into how builders choose to adhere to the new building code and the level of rigor required to do so.

Program	Finding	Recommendation
New Houses Program	NH-F3. Despite the increased awareness about NH in 2010 from newspaper ads or stories (cited by homeowners regarding where they learned about the program), respondents called for more marketing and advertising.	NH-R3. Continue to build awareness through marketing to homeowners in newspaper and internet advertisements as well as home shows.
	NH-F4. Over one-half of homeowners in 2010 were motivated to participate in the NH program because they wanted a house that would save on energy costs and bills.	NH-R4. NH program marketing to homeowners should continue to emphasize energy cost savings from constructing a house through the program.
	NH-F5. Builders were motivated to participate in the NH program because they wanted to find out how energy efficient the new house would be in addition to helping homeowners save energy and building houses that would save on energy costs.	NH-R5. NH program marketing to builders should emphasize the ability to benchmark the energy efficiency of their construction, the market demand for energy efficient homes, and the value of having the EnerGuide label on their houses. Note that if the EnerGuide rating system were not used (i.e., incentives for specific measures mentioned in NH-R1 were used instead), this would not be an option.
	NH-F6. Aside from the HOT 2000 reports and EnerGuide rating, builders received limited materials that they could use to market the home.	NH-R6. The NH program should develop an information package regarding the upgrades that builders can provide to homebuyers.
	NH-F7. The program underwent changes in the past year including changing its name as well as changes in program requirements and incentives. Builders, in particular, were confused as to whether NRCan support of HOT2000 for the program would continue.	NH-R7. ENSC should work to provide a cohesive program with effective marketing, clear requirements and definitive information about how the program will be administered going forward.
	NH-F8. Builders were not clear on the different means of meeting the Nova Scotia energy code. Builder training sessions lacked sufficient details about the NH program. Builders did not understand the HOT2000 report very well in terms of how it worked and how it was measured.	NH-R8. Builder education and training needs to provide greater detail regarding the Nova Scotia building code, the NH program, and understanding the HOT2000 report and the R-2000 approach.

Program	Finding	Recommendation
New Houses Program	NH-F9. Builder training from Nova Scotia Labour & Workforce Development did not make clear that NH is an alternative to the prescriptive method described in the Nova Scotia building code.	NH-R9. ENSC could work with trainers at Nova Scotia Labour & Workforce Development, to explain more clearly that the PerformancePlus program is an alternative to the prescriptive method.
	NH-F10. Delivery Agents reported that reviewing HOT2000 reports was a time-consuming process. Program staff observed that NH could provide more information on tracking or adjusting energy savings, differentiating plug load from building envelope measures.	NH-R10. The NH program should work with NRCan to provide additional training to Delivery Agents on reviewing and interpreting HOT2000 reports. The program should also help Delivery Agents understand how they can track and adjust energy savings, particularly for plug load versus building envelope measures.
	NH-F11. Only one of the four builders reported being satisfied with the scheduling and timing of the audit.	NH-R11. The program should work to improve the scheduling and timing of the audit. Regular communication with builders will also help improve satisfaction with this aspect of program delivery.
	NH-F12. Prescriptive measures, such as solar hot water heaters and water heater tank insulation, had the potential to be double counted by being modeled in HOT2000, and then having prescriptive savings added to the per EnerGuide point savings.	NH-R12. Solar hot water heaters and water heater tank insulation should always be modeled in HOT2000. Prescriptive savings should not be applied to such measures
	NH-F13. The impacts of program-sponsored CFLs could be modeled in HOT2000, but based on our review of program files it appeared that energy auditors were not modeling CFLs.	NH-R13. The program should set a precedent and either instruct auditors to always model CFLs (including their savings in the per EnerGuide point calculations) or never model CFLs.
	NH-F14. Water heater pipe wrap insulation could not be modeled in HOT2000. Drain water heat recovery measures and programmable thermostats could be modeled in HOT2000, but have no effect on the EnerGuide rating or energy consumption of program homes.	NH-R14. It is appropriate to add prescriptive savings for water heater pipe wrap insulation and drain water heat recovery measures to the per EnerGuide point savings calculations.
	NH-F15. All homes that entered the program in 2010 had to adhere to Nova Scotia's new residential energy code and achieve a minimum EnerGuide rating of 80. Relative to the new code upgrade baseline home, the evaluated savings per EnerGuide point was 1,032 kWh.	NH-R15. The code upgrade baseline home (EnerGuide rating of 80) and the per EnerGuide point savings estimate of 1,032 kWh should be adopted by the new houses program for tracking savings in 2011.

Program	Finding	Recommendation
New Houses Program	NH-F16. Some builders and homeowners were participating in the program because they could receive rebates for measures that had already been planned. Per Nova Scotia building code, all new houses had to achieve an EnerGuide rating of 80, and simply by purchasing a heat pump, participants could increase their EG rating to 83 and take advantage of program rebates.	NH-R16. Consider revising the program objectives and components in order to lower the administrative costs of the program and take advantage of existing energy efficiency measures occurring through the Nova Scotia building code.
	NH-F17. In 2010, owners could transfer rebates to builders in order to reduce up-front costs, which was an improvement over the 2009 program. In 2009, builders could only receive reimbursement for the \$250 registration fee. Nonetheless, builders typically did not receive incentives so they were sometimes slow to fill out paperwork, given that they had no monetary reward.	NH-R17. The program should consider providing more direct incentives to builders so that they become more invested in effective program administration and energy efficient outcomes.

Program	Finding	Recommendation
EnerGuide Existing Houses Program	EEH-F1. When approaching program design the DSM Administrator should keep in mind that the Delivery Agents have had to lay off a substantial portion of their staff. Any future program would need to include a ramp up period to allow Delivery Agents to re-hire staff and train new staff.	EEH-R1. In the near term, the DSM Administrator should consider the possibility of incorporating Delivery Agents into their existing residential programs. The Delivery Agents constitute a valuable resource that could be used for program sales and marketing.
	EEH-F2. During the in-depth interviews, Delivery Agents expressed the opinion that federal funding, which had been withdrawn by NRCan, is necessary for the program to exist.	EEH-R2. Should there continue to be no federal funds forthcoming from NRCan, the DSM Administrator should conduct a market potential study to gauge customer interest and program opportunity based on the level of funding available from sources within Nova Scotia, including the provincial government and Efficiency Nova Scotia Corporation. The results of this study may be valuable in helping convince Delivery Agents about the market opportunity and the value of working with the program.

Program	Finding	Recommendation
EnerGuide Existing Houses Program	EEH-F3. The program changes caused a lot of misunderstanding among Delivery Agents who were frustrated with the changes and didn't want to engage with the program until all the changes had been settled.	EEH-R3. The DSM Administrator will need to work to regain the trust and confidence of Delivery Agents in NRCan. Elements that may help with that include convincing Delivery Agents about the market opportunity.
	EEH-F4. The Delivery Agents' license with NRCan for use of the HOT2000 software made it difficult for them to share participants' HOT2000 files with the Program Administrator or its evaluation contractor.	EEH-R4. Any future program should establish an agreement with NRCan that would allow the Program Administrator and its evaluators to obtain participants' HOT2000 files. As NMR had recommended in its 2009 evaluation, the DSM Administrator should also coordinate with NRCan to introduce a waiver form for participants to sign during the initial audit and the final audit. This form would allow the DSM Administrator access to customer contact information which would aid in program evaluations.
	EEH-F5. The 2009 evaluation had found that the EEH program puts the full burden of contractor selection on the customer and does not offer any training for contractors who install the energy efficient equipment. In fact, based on their agreement with NRCan, Delivery Agents were not permitted to provide homeowners with contractor referrals or other contact information.	EEH-R5. Any future program should consider creating a list of contractors who have been pre-approved to work with the EEH program. Pre-approved contractors should be certified in energy efficiency and in installing energy efficient equipment. Customers would still have a choice in contractor selection but would have a readily available list of qualified contractors to from which they can make their choice. ¹⁴

¹⁴ To protect the DSM Administrator from any liability issues, the list can include an appropriate disclaimer stating that it makes no representations or warranties regarding the work of listed contractors, that the listing should not be considered an endorsement of any contractor, and that the customer bears the entire responsibility for any arrangements made with the contractor and work performed by the contractor.

Program	Finding	Recommendation
EnerGuide Existing Houses Program	EEH-F6. The EEH program has both resource acquisition and market transformation goals. A pool of well trained contractors could be a first step in achieving the market transformation goals of the program. Contractor training ensures that energy efficiency measures are installed correctly; without proper training, contractors may not install equipment correctly and the savings opportunities may not be fully realized. In addition, contractors who have been educated to understand and trained to install energy efficient products will be more likely to recommend and offer energy efficient products and services to their clients, both within any future EEH program and outside of the program.	EEH-R6. In order to achieve its market transformation goals, any future program should consider offering training opportunities to trade allies and contractors. These training courses could be required pre-requisites to be added to the pre-approved contractor list and would serve to help create a well-trained and educated contractor pool throughout the province.
	EEH-F7. NRCan's announced withdrawal of federal rebates in March 2010 coincided closely with the announcement of the transition of administration of DSM programs from NSPI to Efficiency Nova Scotia Corporation. This led to a widespread misperception among customers and potential participants that the program had ended. Additionally, Delivery Agents remarked that they did not have sufficient resources to conduct marketing activities for the program.	EEH-R7. A new program would have to work hard to build awareness and establish credibility with the public. The DSM Administrator would need to lead the appropriate marketing and outreach effort. While it should coordinate marketing activities with the Delivery Agents, the primary responsibility would need to be with the DSM Administrator.
	EEH-F8. When participants were asked how they had learned about the program, two-fifths of participants in 2010 (40%) and nearly one-half of the participants in 2009 (48%) said that they had heard about the program through word-of-mouth. This was consistent with observations from the in-depth interviews—three out of four delivery agents said that most people hear about the program through word-of-mouth. Other ways that customers frequently mentioned finding out about the program were through the Internet (14%) and the newspaper (10%).	EEH-R8. Before word-of-mouth can become a significant source of program awareness for a new program, it would need to rely more heavily on standard marketing channels such as newspaper, television, radio and internet. NMR also recommends that a new program should increase public awareness through newsworthy activities such as home shows.
	EEH-F9. Nearly one in three respondents reported that prior to the first audit, they had contacted a contractor about the electric space or water heating equipment that they later installed as part of the EEH program. One of the most important reasons mentioned for having homes evaluated by an Energy Advisor was that respondents had already been thinking about energy efficient upgrades (24%).	EEH-R9. The new program should also seek to increase awareness through trade allies who customers might contact when thinking about energy efficient upgrades, e.g., contractors, hardware stores.

Program	Finding	Recommendation
EnerGuide Existing Houses Program	EEH-F10. Among the most important reason mentioned for having homes evaluated by an Energy Advisor were that respondents wanted to save on their energy bills (26%) and wanted to find out how energy efficient their home was (20%). Furthermore, nearly three out of five 2010 respondents (57%) reported a decrease in their energy bills since the installation of their upgrades.	EEH-R10. Promotions for the new program should emphasize to customers the opportunities to save on energy bills and to learn about the energy efficiency (or inefficiency) of their homes.
	EEH-F11. Three out of four 2010 respondents (76%) mentioned at least one recommended measure that they had decided not to install. Of these respondents, the predominant reason for not installing a measure was that it was too expensive, which was mentioned by slightly under one-half of respondents (46%).	EEH-R11. The new program marketing materials should include the estimated life-time cost savings for measures offered by the program, adjusted based on the rebates and incentives available.
	EEH-F12. About eight out of nine respondents (89%) had noticed a positive change in the comfort of their homes. They most frequently reported that temperatures were more even throughout their homes (71%) and that there were fewer drafts (29%) in their homes.	EEH-R12. Promotions for the new program should also include the non-energy benefits. It is possible that customers are unaware of the effect that program upgrades can have on the comfort levels in their homes.
	EEH-F13. The Measure Effectiveness Index reveals that electronic thermostats, high efficiency air-to-air heat pumps with non-electric backup, electric water heater exposed pipe insulation, high efficiency ductless mini split heat pumps, and electric water heater tank insulation were particularly effective measures for the 2010 program. Conversely, the ETS measures—hot air furnace, room units, and central hydronic systems—were relatively ineffective measures for the 2010 program.	EEH-R13. When promoting and discussing the program with customers, program representatives should keep in mind the relative effectiveness of different measures in terms of uptake and cost per kWh of savings. Where possible, Delivery Agents should seek to focus on promoting the more effective measures such as electronic thermostats, high efficiency air-to-air heat pumps, electric water heater exposed pipe insulation, high efficiency ductless mini split heat pumps, and electric water heater tank insulation.

Program	Finding	Recommendation
EnerGuide Existing Houses Program	EEH-F14. NMR found that the program was double counting savings for a number of measures. Any of the five heat pump measures, solar hot water heaters, and water heater tank insulation all have the potential to be double counted by the program.	EEH-R14. The new program should remove the potential for double counting by applying prescriptive savings only to measures that either cannot be modeled in HOT2000, or have no effect on the EnerGuide rating and energy consumption of a HOT2000 model. Some measures meet these criteria: drain water heat recovery systems, programmable thermostats, and water heater pipe insulation. These measures have no effect on the EnerGuide rating or energy consumption of a HOT2000 model, and therefore cannot be double counted. We suggest that all other measures be modeled in HOT2000 and their savings be calculated through the EnerGuide point system, not through prescriptive savings estimates.
	EEH-F15. There are different savings estimates for every prescriptive measure that is sponsored by the existing and new houses programs. Savings estimates vary only slightly for some measures and drastically for others. For example, water heater tank insulation had a similar savings estimate in both the existing and new houses programs (400 kWh vs. 399 kWh respectively), while programmable thermostats had significantly lower savings in the existing houses program (205 kWh) compared to the new houses program (643 kWh).	EEH-R15. The new program should consider coordinating with any new houses program to maintain consistency with regards to prescriptive savings estimates.
	EEH-F16. It is unclear how the prescriptive savings estimates used by the program were developed in the tracking database.	EEH-R16. The new program should clearly identify how savings estimates are developed in the tracking database, and the assumptions that are used for the tracking data savings calculations. This would help evaluators determine the validity of the program's savings estimates.

Program	Finding	Recommendation
Low Income Households Program	LIH-F1. Although the participant sourcing process worked effectively, the flow of names of prospective participants that came from CNS, via the Nova Scotia Department of Community Services and Service Nova Scotia and Municipal Relations was insufficient. The Outreach Agents reported falling short of their goals for number of participants recruited into the program. This resulted in a lack of consistent work for the Delivery Agents and led to inefficiencies in the delivery process.	LIH-R1. Increase program marketing and outreach efforts to assure a steady, consistent flow of prospective participants. The program should consider expanding to include the rental/multi-unit residential building (MURB) market.
	LIH-F2. Both of the Outreach Agents believe that they could recruit a significantly greater number of participants if the income eligibility threshold were increased, particularly for rural areas.	LIH-R2. Evaluate the possibility of raising the income eligibility threshold for rural areas. Increasing the pool of potential participants in sparsely populated areas will also provide the added benefit of allowing Delivery Agents to more cost-effectively serve those areas through increased efficiencies of time and travel expenses.
	LIH-F3. One in three respondents (34%) to the participant survey reported first learning about REAP from outreach activities: a letter (19%) or a direct telephone contact (15%). Few survey respondents reported learning about the program from the newspaper (5%) or advertisements (3%). Both the Delivery Agents and Outreach Agents reported that customer awareness regarding REAP was low. Both of the Outreach Agents believed that incorporating an advertising budget into the program would allow them to recruit more participants. One Delivery Agent would like to see the program increase its advertising in avenues such as local newspapers in order to enhance customer awareness.	LIH-R3. Consider increasing targeted media advertising of the program. The use of direct contact outreach methods generally limit recruitment to one customer at a time and the program should consider more mass media approaches such as newspaper or other media advertising.

Program	Finding	Recommendation
Low Income Households Program	LIH-F4. Customers were motivated to participate in the program primarily because of energy savings and the associated financial benefit—48% were motivated by saving on energy costs/bills. Among the few respondents who had concerns about participation, most were skeptical that the program was in fact free.	LIH-R4. Continue to promote the savings benefits of the program with an emphasis that the program is truly free of charge
	LIH-F5. Participation in the program resulted in 40% of the respondents reporting a reduction in their energy bills. Ten participants mentioned an average monthly savings of \$42. Approximately seven out of ten (72%) were satisfied with the savings from the program measures.	LIH-R5. Prospective participants should be made aware of the relationship between the measures installed by the program and future cost savings.
	LIH-F6. Installed measures had a positive effect on comfort level. About three out of five respondents (61%) reported that their comfort level in the house had improved. After measures were implemented, about four out of five respondents noticed fewer drafts (80%) and consistent temperatures throughout the house (79%).	LIH-R6. Also emphasize to participants that the energy saving measures not only provide savings benefits but also improve comfort levels in the home.
	LIH-F7. Nearly all of the respondents (97%) also reported that they would recommend the program to a friend or family member and more than four out of five respondents (83%) reported that they actually have recommended the program to a family member or friend. However, only about one in eight participants (13%) reported that they found out about the program through word-of-mouth.	LIH-R7. As an additional participant recruiting mechanism, the program may want to consider offering a further incentive to participants for recommending the program to their friends and family.
	LIH-F8. The DSM Administrator (via CNS) worked effectively with SNSMR (Service Nova Scotia and Municipal Relations (SNSMR) to identify income eligible electrically heated households from the pool of low income applicants to the Heating Assistance Rebate Program. SNSMR collects data on the home heating source, income, and address of applicants to the Heating Assistance Rebate Program.	LIH-R8. Identifying eligible participants through the partnership with SNSMR is efficient and cost-effective. The DSM Administrator should continue to utilize this resource.

Program	Finding	Recommendation
Low Income Households Program	LIH-F9. There is a misperception amongst delivery agents, that only homes that required significant building envelop upgrades were eligible for the program, which led one of the Delivery Agents to think that the number of homes that were not properly screened had increased since 2009.	LIH-R9. Training and communications of Delivery Agents should clearly explain the eligibility requirements for electrically heated homes in the program.
	LIH-F10. The expectations of participants recruited by the Outreach Agents are higher than those recruited through the other channels. Specifically, homeowners recruited through the outreach channel more often lacked understanding of the audit process and believed with certainty that the program would provide them with a new refrigerator, freezer, and/or a certain amount of insulation. On the other hand, one of the Outreach Agents received phone calls from some participants complaining that the Delivery Agents had led the participants to believe that they would be receiving a new appliance when in fact they were not.	LIH-R10. Provide clear guidelines to all program delivery personnel involved in customer contact regarding setting customer expectations from the program. Develop printed leave behinds that clearly describe what the customer should and should not expect from the program.
	LIH-F11. Participants who apply to the program through the Outreach Agents are sent a letter informing them that they will receive a welcome letter from CNS in several weeks. However, the Outreach Agents reported process delays of five to six months.	LIH-R11. Reduce time from participant recruitment to first contact. The Outreach Agents should be in direct contact with the program administrator regarding applicant follow ups. Set a goal of first contact within four to six weeks.

Program	Finding	Recommendation
Low Income Households Program	LIH-F12. The LIH the program is not consistently referred to by the same name throughout the program delivery process. Outreach Agents referred to the program as the Nova Scotia Low Income Households program when they recruited participants. However, the welcome letter that CNS sent participants referred to the program as REAP. One of the Outreach Agents reported that on more than one occasion, customers had contacted her to follow up on the status of their applications, when in fact they had been sent welcome letters from CNS but had failed to recognize them as the program to which they had applied. In addition, The Outreach Agents reported customer confusion between the REAP program and EnerGuide for Existing Houses program..	LIH-R12. The DSM Administrator should establish a single name for the program that is consistently used by everyone involved in program delivery. This is important not only for eliminating customer confusion or misunderstanding but also for building a differentiated brand identity.
	LIH-F13. The number of Delivery Agents decreased from four to three in 2010. The region formerly serviced by the Delivery Agent that was unsuccessful in the bidding process was taken over by two of the three Delivery Agents.	LIH-R13. The DSM Administrator should continue to monitor the delivery process in all regions in order to ensure that resources are sufficient to carry out the program as designed.
	LIH-F14. The Delivery Agents reported that the protocol for replacing refrigerators and freezers was burdensome and that they were not properly equipped to determine the age of participants' old refrigerators and freezers.	LIH-R14. The DSM Administrator should review and update the guidebook for determining the manufacture date of refrigerators and freezers. This guidebook should be reviewed with Delivery Agents to ensure that it will meet their needs. Also, some programs use the serial number of the appliance to determine the date of manufacture. The Program Administrator may want to consider using this approach.
	LIH-F15. Program staff discussed separating Scope I and Scope II audits as a means of increasing the cost effectiveness of the overall program. Delivery Agents would visit homes to perform Scope II upgrades only. While performing the Scope II upgrades, Delivery Agents would identify and record the homes with the greatest potential energy savings from Scope I measures.	LIH-R15. Before implementing any significant changes to the program design, the DSM Administrator should carefully consider the ramifications of the change both from a logistical and financial perspective. Include the Delivery Agents in the determinations regarding making such a change.

Program	Finding	Recommendation
Low Income Households Program	LIH-F16. As reported in the 2009 evaluation, the LIH program tracking information did not include a unique identifier for either participants or prospective participants. At no point during the recruiting process or customer screening were customers assigned a unique identifier.	LIH-R16. The DSM Administrator should introduce a unique identifier as early in the customer recruitment process as possible. The unique identifier should also include a field to identify the source of participant name, e.g., DCS, Outreach Agent, SNSMR, etc.
	LIH-F17. As reported in the 2009 evaluation, the Delivery Agents submit monthly reports to CNS including Scope I and Scope II upgrades. Contractors submit invoices at the end of each month to CNS. Based on examination of program tracking records, it appears that Delivery Agents currently submit partial invoices and invoice separately for Scope I and Scope II measures. Multiple invoices can add to the overall time taken to complete paperwork for the program.	LIH-R17. The DSM Administrator should consider requiring Delivery Agents to submit only one invoice for each home. This will require that Delivery Agents complete all work associated with a home before submitting an invoice.
	LIH-F18. The communication lines stayed open between the Outreach Agent and the participants they recruited, but not between the participants and CNS. Both of the Outreach Agents reported instances in which they had passed along suggestions, concerns, or customer complaints to the DSM Administrator and CNS program managers but received no resolution regarding the issues. In addition, the Outreach Agents were not regularly updated with information regarding delays in the application process or the status of individual complaints. However, participants continued to view them as a source of information and may have contacted them for information to which they had no access.	LIH-R18. Integrate Outreach and Delivery Agents as full partners in program delivery. Establish a feedback loop for Outreach and Delivery Agents so that they can stay updated on the status of applications, the progress of work on participant homes, and the response to any participant issues or complaints. This might possibly be accomplished by providing access to an online data tracking system.
	LIH-F19. As reported in the 2009 evaluation, while the DSM Administrator was receiving the proper information, it seems that it was receiving this data in varying formats. Furthermore, the DSM Administrator also used a spreadsheet to maintain and track program participation records.	LIH-R19. Provide a standardized data entry form to all Delivery Agents. If possible, transition program data tracking to an online system that can also be accessed by Delivery Agents.

Program	Finding	Recommendation
Low Income Households Program	LIH-F20. Some respondents reported a substantial discrepancy between the measures that were recorded as having been installed and what they thought actually was installed. In particular, verification of building envelope measures decreased from 95% in 2009 to 77% in 2010. These low levels of verifiability could be due to poor respondent recall or could indicate that the Delivery Agents had not installed all of the measures identified in the tracking records.	LIH-R20. Continue to require the Delivery Agent to walk participants around their homes after installation is complete and attest to the installation of each measure
	LIH-F21. Quality control activities increased in 2010 with the inspection of forty retrofitted homes (five from each service territory) by third-party contractors, and with the implementation of the requirement that participants sign off on the measures installed after the work has been performed.	LIH-R21. Also utilize the results of quality control activities to identify and address potential discrepancies in measures reported to have been installed by Delivery Agents.
	LIH-F22. Three out of five respondents (60%) reported that after receiving information from the energy audit, there was a change in their behavior with regard to their use of energy at home: 51% now turn off lights where they might not have before and 22% set the thermostat lower. Around three out of five reported more interest in energy efficiency (61%) and almost one-half reported increased knowledge of energy efficiency (46%).	LIH-R22. Education of low-income consumers on continued energy efficient practices offers a payback in energy savings long after a customer participates in the program. Focus on improving the energy efficiency interest and knowledge of participants by providing educational materials.
	LIH-F23. Overall satisfaction with the program was high (90%). At least eight out of ten respondents were satisfied with each aspect of the program. However, satisfaction with several program aspects decreased between 2009 and 2010. Satisfaction with the energy conservation measures installed decreased from 93% to 81%. In addition, satisfaction with the energy efficiency presentation decreased from 95% to 84%. Lastly, satisfaction with the quality of the work completed declined from 95% to 81%. While about one out of four respondents (24%) offered a recommendation to improve the program, the top recommendation offered by respondents was to improve the quality of work (5%).	LIH-R23. The program has been successful as measured by perceived satisfaction to participants. The DSM Administrator should continue to monitor customer satisfaction, particularly with regards to the energy conservation measures installed, the energy efficiency presentation, and the quality of the work completed.

Program	Findings	Recommendations
Efficient Products – Retail Program (Power Down - CFLs)	PD:CFL-F1. With the approaching phase-out of incandescent bulbs in 2012, the PD program will need to drop rebates for regular CFLs. In 2010, specialty CFLs accounted for a lower proportion (9%) of CFLs sold through the program than in 2008 (18%) and 2009 (16%). Thus, the PD program fell short of its 2010 goal of 30% of all CFLs sold being specialty CFLs.	PD:CFL-R1. The DSM Administrator should start paring back on incentives for regular CFLs. Concomitantly, the program should shift to an increased focus on specialty CFLs and educating consumers about them. The program should continue offering markdowns on all sizes of specialty CFL packages. These markdowns are the most likely reasons for the proportional increase of specialty CFLs among participants' qualifying purchases.
	PD:CFL-F2. In 2010, the program discontinued the majority of the educational components of the program including the in-store giveaway events. The 2009 program evaluation identified the in-store giveaway events as a strength of the program since they offered a good opportunity for consumers to try specialty CFLs and triggered a call to action for consumers. In addition, program staff believed these events may have even sparked additional sales of CFLs.	PD:CFL-R2. Based on the relative decrease in specialty CFL sales as a proportion of overall sales in 2010, NMR recommends that the future CFL programs consider including in-store giveaway events for specialty CFLs.

Program	Findings	Recommendations
Efficient Products – Retail Program (Power Down CFLs)	PD:CFL-F3. A number of program and non-program factors indicate that there is likely to be a substantial need to educate customers about proper disposal and to provide recycling for CFLs in Nova Scotia. These include existing high levels of awareness and CFL users, increases in sales and adoption due to the markdowns and exchanges, and the 2012 phase-out of incandescent bulbs. The PD program itself has been effective in motivating increased customer purchases of CFLs. Thus, there will be an increasing need to dispose of and recycle CFLs.	PD:CFL-R3. The PD program should work with retailers to develop/expand locations where consumers can dispose of CFLs for recycling. Prior to developing a recycling program, the DSM Administrator should develop baseline data on CFL disposals. Note that some retailers already offer facilities for CFL drop off recycling at retail store locations in Nova Scotia.
	PD:CFL-F4. As the 2012 date for phase-out of incandescent bulbs gets closer, there is likely to be some consumer hoarding of these bulbs.	PD:CFL-R4. The PD program should consider offering an incandescent bounty program that offers coupons or rebates upon turn-in of incandescent bulbs.
	PD:CFL-F5. Anticipating having to drop regular CFLs from its lineup of rebated energy efficiency products, the PD program has sought other energy efficiency products to rebate and yield energy savings. LED technologies are still maturing but some mainstream applications are starting to enter the market, albeit still at a higher cost than CFLs.	PD:CFL-R5. The program should evaluate the opportunities for rebating LEDs (other than Christmas lights).
	PD:CFL-F6. The PD program appears to have made substantial inroads into the CFL market and appears to have moved Nova Scotia residents higher on the diffusion curve for energy efficient lighting.	PD:CFL-R6. NMR recommends that the Program Administrator consider doing a socket saturation study in 2011. This will entail on-site visits to a random sample of households to collect data on socket counts and socket saturation as well as other information on lighting usage and behaviors. This can help understand and clarify the stage of the market on the diffusion curve for energy efficient lighting.

Program	Findings	Recommendations
Efficient Products – Retail Program (Power Down CFLs)	PD:CFL-F7. In both 2008 and 2009, based on feedback from program staff and retailers, NMR recommended that the DSM Administrator conduct a review of the overall marketing approach to increase the visibility and reach of program information and promotional materials. In 2010, the program was branded together with promotions for light fixtures, controls, and appliances as the ‘Power Down’ program. In addition, for 2010, program marketing began earlier and included: direct mail, radio and newspaper advertisement, inclusion of rebates and featured products in retailer flyers, and in-store signage. The results of these changes to marketing and outreach resulted in extremely high awareness and recall among both participants and non-participants. In contrast to both 2008 and 2009, 2010 participants (81%) and non-participants (86%) reported high levels of awareness of the program; and both participants (76%) and non-participants (69%) reported high levels of recall of program promotional materials.	PD:CFL-R7. The DSM Administrator should build on its 2010 marketing efforts to ensure that it continues to produce results in future program years. The program should consider developing a longer-term branding strategy to ensure high levels of awareness and participation.
	PD:CFL-F8. During an on-site store visit by an NMR representative, it was difficult to tell which specific items were discounted, especially for dimmers. For CFLs, all ENERGY STAR CFLs were discounted but even for these, the label did not tell customers to look for the ENERGY STAR logo. In a subsequent discussion with the program manager, NMR was told that each retailer had adapted the product tags and signage to their specific practices and, as a result, the program was not able to establish consistency in program signage and advertising.	PD:CFL-R8. To the extent possible, the program should reach agreements with participating retailers that will establish consistent advertising and signage. Recognizing that each retailer will also want to maintain control over and consistency with their own advertising and signage formats, the program should seek to establish minimum requirements regarding the informational content of such displays.

Program	Findings	Recommendations
Efficient Products – Retail Program (Power Down Fixtures, Controls & Appliance)	PD:F&C, APP-F1. While lighting products are often purchased in the fall, major appliances such as refrigerators and clothes washers are purchased year-round, most often when the existing appliance fails or homes are remodeled. As some retailers pointed out, major appliances are often not purchased at the end of the year when households are focused on holiday celebrations and gift-giving.	PD:F&C, APP-R1. Consider starting the program earlier in the year, to avoid conflicting with the end of year holiday season.
	PD:F&C, APP-F2. Some retailers would have liked more advance notice of program implementation. One retailer said that more advance notice would have allowed him to order additional stock to ensure that items were available for purchase.	PD:F&C, APP-R2. Retailers need to be notified well in advance of program rollout, particularly if the program will include higher efficiency products that are in limited supply. Any notification should include specifics on the products that will be eligible for the program so that retailers can order additional stock. In addition to ensuring an adequate supply of the rebated products, notifying the retailers early allows them to promote the program in the local media.
	PD:F&C, APP-F3. Some retailers believe the program would have benefited from more extensive marketing including: more advertising in smaller local newspapers, better signage, and in-store events. Although the Power Down program had generally high name recognition in the province, customers may not have been making the connection between the program and the products available in their local store.	PD:F&C, APP-R3. The program should consider increased targeted, local area marketing and visits from program representatives.

Program	Findings	Recommendations
Efficient Products – Retail Program (Power Down – Fixtures & Controls)	PD:F&C-F1. This study estimated high free ridership rates for all of the evaluated fixtures and controls products. This indicates that a large share of the rebated sales would have taken place in the absence of the program.	PD:F&C-R1. The program should consider dropping small products with high free-ridership rates such as indoor light timers. Instead, the program should consider a more intensive customer education campaign regarding the value and benefits of such technologies and energy efficiency in general.
	PD:F&C-F2. Free ridership was estimated to be 60% for fixtures and, although not evaluated, is likely to be substantial for dimmers and programmable thermostats as well.	PD:F&C-R2. The Program Administrator should consider re-focusing its efforts for promoting these products to the new construction and major renovation market instead. Programmable thermostats may also be promoted in tandem with installations of new HVAC systems.
Efficient Products – Retail Program (Power Down – Appliance)	PD:APP-F1. The conducted evaluation estimated high free-ridership rates for both the refrigerators (72%) and the clothes washers (85%) rebated through the PD program. This indicates that a large share of the rebated sales would have taken place in the absence of the program.	PD:APP-R1. Free-ridership rates can be lowered by rebating higher efficiency appliances only, such as models rated by the Consortium for Energy Efficiency (CEE) as Tier 3, which have much lower market penetration rates. Free-ridership rates may also be lowered by offering package deals where a consumer would have to purchase both a refrigerator and a clothes washer. This may induce households to replace an additional appliance with a high efficiency model once they are already in the market.
	PD:APP-F2. Independent retailers were not originally included in the program and came on board a month after the program had started. Contrary to the expectations of the program implementer, some independent retailers saw a large percentage of sales.	PD:APP-R2. Retailers need to be notified well in advance of the program rollout, particularly if the program will include higher efficiency appliances that are in limited supply. In addition to ensuring an adequate supply of the rebated products, notifying the retailers early allows them to promote the program in the local media.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F1. Around four out of five respondents who retired each appliance type (76% for refrigerators; 79% for freezers; and 80% for dehumidifiers) reported that the appliance picked up by the program was plugged in all or most of the time in the year before it was picked up. Also, in spite of high free ridership levels, the program was able to achieve its savings goals.	ARR-R1. Appliances picked up by any future program have the potential to offer significant energy savings. The DSM Administrator should consider expanding the pilot to a full-scale program.
	ARR-F2. The Appliance Retirement Program had high free ridership (66%). One contractor suggested that in an effort to decrease free ridership, the call center make it clear that only appliances that are currently plugged in, working, and are used regularly be allowed to be eligible for the program.	ARR-R2. Any future program should reinforce screening efforts at the participant registration stage to screen out potential free riders.
	ARR-F3. The Appliance Retirement Program tracking database assumed that all dehumidifiers were replaced, but none of the refrigerators and/or freezers were replaced. Approximately one-half of the respondents who removed a refrigerator (56%) or freezer (50%) and three-quarters of those who removed a dehumidifier (73%), replaced the appliance with another appliance of the same type after it was picked up by the program.	ARR-R3. Appliances that are replaced do not save as much energy as appliances that are retired. The DSM Administrator should consider the implications of appliance replacements when considering the costs and benefits of the appliance retirement program. The impact evaluation for 2010 reflects these differences.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F4. The appeal of the Appliance Retirement Program lies in the ease with which customers can enroll as well as the relative uniqueness of its offering. Respondents reported that they found it relatively easy to enroll in the program, whether they enrolled by phone or online. A program contractor also observed that customers have only limited opportunities to have their appliances picked up and recycled outside of the Appliance Retirement Program and the other options require that customers pay a fee.	ARR-R4. Any future program design should seek to replicate these program elements that were important facets of the appeal of the pilot.
	ARR-F5. While participant motivations to dispose of their appliances through the program varied. The program's offer to pick up the appliance appeared to be the primary motivation for those who retired refrigerators and freezers. In contrast, the primary motivation for those who retired dehumidifiers appeared to be the desire to save on energy use or costs. However, it is important to note that the program incentive also was an important motivation cited particularly by those who retired freezers and dehumidifiers.	ARR-R5. Any future program design should consider the motivations of customers. The combination of ease of participation and pickup services with an incentive provided a strong motivation for customers to participate in the program.
	ARR-F6. The single most influential factor influencing customers' decision to participate in the program was the removal and recycling services provided for free as part of the program. Incentives tended to receive lower influence ratings. Furthermore, one of the program contractors thought that it may not be possible to justify the cost of picking up smaller appliances such as dehumidifiers.	ARR-R6. Any future program design should consider reducing the incentive amounts offered for appliances. The incentive structure should also factor in the relative costs and benefits of picking smaller appliances, possibly bundling pickups only with larger appliances.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F7. Respondents with a secondary refrigerator or a freezer were asked how important it was to have a spare refrigerator or freezer for storing food and beverages. A majority of respondents (65%) who removed a spare refrigerator thought it was not necessary; while a majority of respondents (56%) who removed a freezer thought it was necessary. In addition, the vast majority of respondents (91%) said they had experienced no drawbacks after having disposed of their appliance.	ARR-R7. When developing its incentive structure, any future program design should also factor in the variation in importance of different secondary appliances to customers.
	ARR-F8. The appeal of the Appliance Retirement Program lies in the ease with which customers can enroll as well as the relative uniqueness of its offering. Respondents reported that they found it relatively easy to enroll in the program, whether they enrolled by phone or online. A program contractor also observed that customers have only limited opportunities to have their appliances picked up and recycled outside of the Appliance Retirement Program and the other options require that customers pay a fee.	ARR-R8. Any future program design should seek to replicate these program elements that were important facets of the appeal of the pilot.
	ARR-F9. While participant motivations to dispose of their appliances through the program varied. The program's offer to pick up the appliance appeared to be the primary motivation for those who retired refrigerators and freezers. In contrast, the primary motivation for those who retired dehumidifiers appeared to be the desire to save on energy use or costs. However, it is important to note that the program incentive also was an important motivation cited particularly by those who retired freezers and dehumidifiers.	ARR-R9. Any future program design should consider the motivations of customers. The combination of ease of participation and pickup services with an incentive provided a strong motivation for customers to participate in the program.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F10. The single most influential factor influencing customers' decision to participate in the program was the removal and recycling services provided for free as part of the program. Incentives tended to receive lower influence ratings. Furthermore, one of the program contractors thought that it may not be possible to justify the cost of picking up smaller appliances such as dehumidifiers.	ARR-R10. Any future program design should consider reducing the incentive amounts offered for appliances. The incentive structure should also factor in the relative costs and benefits of picking smaller appliances, possibly bundling pickups only with larger appliances.
	ARR-F11. Respondents with a secondary refrigerator or a freezer were asked how important it was to have a spare refrigerator or freezer for storing food and beverages. A majority of respondents (65%) who removed a spare refrigerator thought it was not necessary; while a majority of respondents (56%) who removed a freezer thought it was necessary. In addition, the vast majority of respondents (91%) said they had experienced no drawbacks after having disposed of their appliance.	ARR-R11. When developing its incentive structure, any future program design should also factor in the variation in importance of different secondary appliances to customers.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F12. The Appliance Retirement Program included a number of organizations that had to work together to deliver the program. Internal communications amongst so many organizations can be difficult and it is perhaps not surprising that some of the organizations involved reported communication problems. Perhaps typifying the communications issues, the most notable oversight occurred when the DSM Administrator decided to extend the program into a second phase. Two of the program's contractors indicated that they learned about the program extension only after it was announced on television. Furthermore, the outsourced call center for the second phase was not fully -prepared due to time constraints and the level of marketing and outreach also was significantly reduced for the second phase. These factors combined contribute to lower participation levels in the second phase of the program.	ARR-R12. Close planning and coordination, and clear lines of internal communications between the multiple organizations will be critical to the success of any future program. The DSM Administrator should include all involved organizations early on in the planning stage and develop internal communications protocols to ensure that all of them are on the same page. Communications protocols could include regular emails shared with all stakeholders and regularly scheduled teleconferences.
	ARR-F13. The appliance replacement participant interviewed said that she targeted for replacement those refrigerators that were in the worst condition. According to this participant, most of the refrigerators replaced were around 20 years old. When asked why she decided to replace the refrigerators, her reasons varied based on who was responsible for the electric bills. In units where the tenants were responsible for the electric bill, she replaced the refrigerators because they were near the end of their useful lives. In units where the tenants were not responsible for the electric bill, she replaced the refrigerators to take advantage of cost savings from lower utility bills. In addition, she said that the rebate, the discounted price of refrigerators, and the removal and recycling services, all were very influential in her decision to participate in the program.	ARR-R13. The combination of removal services and incentives offered by the program worked together to motivate customers to participate in the program. In any future program, the DSM Administrator should continue to bundle incentives together with services (such as removal services) that make for a compelling value proposition for participants.

Program	Finding	Recommendation
Appliance Retirement & Replacement	ARR-F14. The appliance replacement participant identified two areas of dissatisfaction with the program—both relating to payment for the refrigerators. (i) She was unaware that she would be unable to use a credit card to pay for the refrigerators. (ii) She also was dissatisfied that it took over two months for the program to provide her with her rebate.	ARR-R14. Any future program should make sure that participants can pay for refrigerators by their preferred method. In addition, the program should seek to reimburse participants in a timely fashion. Additionally, the program may want to consider allowing participants to pay only for the portion of the refrigerators not covered by program incentives. Instead of reimbursing the participant for the rebate amount, the program could work with their appliance vendor so that participants purchase refrigerators at a discount and the rebates are remitted to the appliance vendor.
	ARR-F15. Due to the status of the Appliance Replacement Program as a pilot, it had a limited target for the number of refrigerators to be replaced. Program promotions consisted solely of cold calls to potential participants and meetings with a few property owners. Thus the pilot program did not have an opportunity to fully engage with and assess the potential opportunities in the multi-family sector.	ARR-R15. Any future program should explore the following potential opportunities in the multi-family sector: • Affordable housing property owners. This may be one the easiest markets to reach in the multi-family sector. Energy costs are a significant portion of their clients' housing costs and they see it is as part of their core mission to ensure that their properties are energy efficient. • Bundle incentives. Evaluate bundling incentives by requiring participants to retire and replace multiple appliances to receive the incentives, or providing higher incentives for multiple appliances.
	ARR-F16. When targeting the multi-family market, split incentives are often the most common barrier encountered.	ARR-R16. To mitigate the split incentives barrier, the program should seek to educate multi-family landlords on the non-energy benefits of improving the energy efficiency of the properties such as increased tenant comfort, higher tenant satisfaction, and reduced tenant turnover.



Impact and Process Evaluation: Efficient Products Retail Program 2010

February 25, 2011

Final Report

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Executive Summary

This report presents the results of the process and impact evaluations of the Efficient Products Retail program which was marketed under the name Power Down (PD). NMR Group, Inc. (NMR) conducted the evaluation. In 2010, the PD program offered rebates and incentives through partnerships with retailers throughout Nova Scotia, covering the following products: ENERGY STAR CFLs, ENERGY STAR refrigerators, ENERGY STAR clothes washers, ENERGY STAR indoor light fixtures, and various controls, including programmable thermostats for electric baseboard heaters, indoor lighting timers, heavy duty outdoor or pool timers, power bars with integrated timers, and dimmer switches.

NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

Given the broad nature of products covered by the PD program and the various evaluation activities conducted in 2010, this report subdivides the results into three program components:

- CFLs (CFL)
- Light fixtures and controls (F&C)
- Appliances (APP)

The process evaluation for the CFL component was based on in-depth interviews with DSM Administrator staff and implementation contractors as well as telephone surveys with 70 program participants and 70 non-participants.

The process evaluation for the F&C program component was based on in-depth interviews with DSM Administrator staff and implementation contractors as well as telephone surveys with 47 chain store managers participating in this portion of the PD program.

The process evaluation for appliances was based on in-depth interviews with DSM Administrator staff and implementation contractors as well as telephone surveys with 16 store managers, including nine with chain retailers and seven with independent retailers.

All the interview guides and survey instruments were developed by NMR staff.

IMPACT EVALUATION FINDINGS

The CFL portion of the Power Down program impact evaluation drew upon the participant and non-participant surveys to estimate net participant sales using a difference-of-differences approach based on establishing a counterfactual that incorporates the effects of free-ridership and spillover. In order to translate net sales into net energy savings, the evaluation drew upon data from a 2009 study of markdown programs in the New England states of Connecticut, Massachusetts, Rhode Island and Vermont to provide conservative estimates for parameters not addressed in this study, such as hours of use, installation rates, wattage displacement, coincidence with peak, and measure life.¹

¹ NMR, RLW and GDS (2009) *Residential Lighting Markdown Impact Evaluation*. Submitted January 20th, 2009

The impact evaluations for F&C and APP program components drew upon evaluation databases such as the California Measurement Advisory Council (CALMAC) and the Consortium for Energy Efficiency (CEE) databases to identify previous research conducted for similar measures. Using databases such as these, NMR reviewed a variety of secondary sources to assess the validity of the program's current savings assumptions for fixtures, controls, and appliances.

The first-year energy and demand savings estimates can be found in Table 1. All savings presented are at the generator level (based on line losses of 11.88%) and the CFL savings include the impact of interactive effects of heating.

Table 1: 2010 Program Energy Savings Estimates

	Gross Savings at Generator		Net-to-Gross Ratio ²	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
CFLs	1,485.7	6,865	133%	1,975.9	9,130
ENERGY STAR indoor light fixtures	70.1	307	40%	28.0	123
Programmable thermostats	108.8	522	100%	108.8	522
Indoor light timers	26.7	128	16%	4.3	20
Outdoor/heavy duty timers	191.3	918	33%	63.1	303
Dimmer switches	20.8	100	100%	20.8	100
Power bars with timers	2.7	13	24%	0.6	3
ENERGY STAR refrigerators	57.7	277	28%	16.2	78
ENERGY STAR clothes washers	114.2	548	15%	17.1	82
Total Program	2,078.0	9,678	107%	2,234.8	10,361

Findings and Recommendations³

The CFL component of the PD program is faced with the upcoming phase-out of incandescent bulbs starting in January 2012.⁴ The first stage of the phase-out will ban 75W to 100W general service incandescent lamps with 1050 to 2600 lumens output. The second stage of the phase-out, starting in January 2013, will ban 40W to 60W general service incandescent lamps with 250 to 1049 lumens output. Thus, the CFL program component will reach the limits of its value for securing energy savings over the course of 2011 and 2012. In anticipation of this eventuality, in 2010, the PD program sought to diversify

² This evaluation estimated net-to-gross ratios for CFLs based on participant and nonparticipant surveys. The free-ridership and net-to-gross ratio estimates for fixtures, controls, and appliances were based on interviews with retail store managers. So as to limit the interview length with the very busy retail store managers, the evaluation limited its questions to measures that were initially projected by the PD program to provide the most energy savings. Programmable thermostats and dimmer switches were projected by the program to provide the least energy savings and were excluded from interview questions. These measures were accordingly deemed to have zero free-riders and a 100% net-to-gross ratio. See Section 3.4 for details.

³ Note that the numbering for these findings and recommendations corresponds to the numbering in a composite table in the overall Executive Summary of the evaluation of all of DSM Administrator's 2010 Demand Side Management programs.

⁴ <http://oee.nrcan-rncan.gc.ca/regulations/bulletin/general-service-lamps-dec08.cfm?attr=4>

its sources for achieving energy efficiency goals by expanding the range of energy efficiency measures that it incentivized.

At the retail level, these other energy efficiency measures included ENERGY STAR indoor light fixtures, programmable thermostats, indoor light timers, heavy duty outdoor/pool timers, dimmer switches, power bars with timers, ENERGY STAR refrigerators, and ENERGY STAR clothes washers. The fixtures and controls resemble CFLs in that they are relatively low-cost items that can help save energy. However, unlike light bulbs, fixtures and controls don't easily burn out, have longer life spans, and users are not likely to keep a stock of them for later use. Hence they are purchased less frequently and typically only as needed. Similarly, refrigerators and clothes washers are infrequently purchased items, not only because of their long life spans but also because of their high costs. As Table 1 above shows, these other retail products exhibit low net-to-gross ratios,⁵ reflecting a profile of products that are purchased only as needed as well as, in the case of the appliances, relatively low rebates in relation to the purchase price. Thus, most of the PD program sales of these products were in effect to free-riders who were planning to purchase them anyway, regardless of the presence or absence of the program.⁶

As Table 1 also shows, the CFL program component continued to account for the bulk of the energy savings (71% of gross energy savings and 88% of net energy savings) from retail product sales in the Power Down program. Additionally, the track record for sales of the other retail products seems to support the profile of infrequent purchase behaviors associated with their previously described characteristics. Thus, it appears that it will be extremely difficult for the PD program to have these other retail products provide anywhere near the energy savings that were derived from the CFLs.

Under these circumstances, NMR believes that the PD program should consider the following steps to help mitigate the impact of the pending removal of regular CFLs from its array of rebated measures.

- Focus on specialty CFLs.
- Offer an incandescent bounty program that offers coupons or rebates upon turn-in of functioning incandescent bulbs. Note that this may also help limit hoarding, which is anticipated to occur in advance of the 2012 phase-out of incandescent bulbs.
- Evaluate the opportunities for rebating LEDs (other than Christmas lights).
- Expand consumer education including in-store events to educate and engage the public.
- Focus on new construction and major renovation projects for promoting products such as ENERGY STAR fixtures, programmable thermostats and dimmer switches. Programmable thermostats may also be promoted in tandem with installations of new HVAC systems.
- Offer rebates only for super-efficient refrigerators and clothes washers—those rated as Tier 3 by the Consortium for Energy Efficiency (CEE).
- Offer packaged rebates that provide incentives only when consumers purchase multiple energy efficient appliances.

⁵ The exceptions were thermostats and dimmer switches for which the evaluation did not estimate a net-to-gross ratio and were deemed to have a net-to-gross ratio of 100%. See Footnote 2, above, and Section 3.4.

⁶ Another factor that may have contributed to the high free ridership levels is that the program provided rebates only in two months of the year, limiting the ability of the program to build momentum and draw in consumers other than those who had been planning to purchase the products anyway.

CFL Component

CFL sales through the PD program continued to increase in 2010. Notably, there was a significantly higher incidence of program participants in 2010 (31%) than in 2009 (17%). Actual sales data on program purchases revealed an increase from 155,222 CFLs in 2008 and 117,005 CFLs in 2009 to 179,591 CFLs in 2010, and the Power Down program greatly exceeded 2010 sales goals of 65,000 CFLs. Despite the strong performance in 2008 and 2009 and the loosening of restrictions in 2010, the goals for the CFL portion of the PD program declined significantly compared to the 2009 Retail Markdown Program, from 186,990 total CFLs to 65,000 total CFLs, a decline of 65%.

The 2010 CFL portion of the PD program also slipped in its promotion of specialty CFLs. Based on program goals, the PD program targeted 30% of all CFLs sales to be specialty CFLs. In 2010, specialty CFLs accounted for nine-percent of all sales compared to 16% of all sales in 2009 and 18% in 2008.⁷ In the past, the DSM Administrator has used in-store promotions, giveaway events, and incentives designed to help promote the use of specialty CFLs. However, in 2010, these program components were excluded; these changes to the program design and implementation likely contributed to lower adoption of specialty CFLs as a proportion of all CFLs sold through the program.

The net-to-gross ratio for the program exhibits an increase in spillover from the program between 2008 and 2010; the net-to-gross ratio increased from 0.96 in 2008 to 1.16 in 2009 to 1.33 in 2010. Due to the increased net-to-gross ratio, while actual program sales rose by 53% in 2010, net sales rose by 76%.

Fixtures and Controls Components

Based on the survey of retail store managers, a large portion of sales of fixtures and controls would have happened in the absence of the PD program. As noted previously, this may be due to the characteristics of fixtures and controls as products that are typically purchased only if needed. The PD program should consider focusing instead on new construction and major renovation projects for promoting fixtures and controls such as programmable thermostats and dimmers.

Despite retailer concern that there was insufficient marketing, both participants and non-participants interviewed for the CFL portion of the PD program reported high levels of program awareness, substantially higher than in 2009 or 2008. Part of the reason for the high levels of PD program awareness may have been the addition of fixtures and controls which greatly increased the breadth of products rebated by the program.

⁷ Information on the number of specialty CFLs sold through the program in 2008 was not available. Instead, the proportion of specialty CFLs was estimated based on the 2008 participant survey responses.

Appliance Rebates Component

As with fixtures and controls, retailers interviewed reported that the majority of refrigerator and clothes washer sales would likely have taken place in the absence of the program. Given the high levels of free-ridership found in 2010, it may be necessary for the program to target even higher levels of efficiency in any future appliance rebate programs. The Consortium for Energy Efficiency (CEE) Super-Efficient Home Appliance Initiative (SEHA) has established performance tiers for appliances. By rebating appliances rated as Tier 3, the DSM Administrator could reduce free-ridership rates and increase gross energy savings per unit. In addition, the DSM Administrator could offer packaged rebates that offer incentives only when consumers purchase multiple energy efficient appliances.

According to some retailers, at the end of the year, consumers are often more focused on holiday celebrations and gift-giving and are, therefore, less likely to purchase major appliances. In addition, major appliances such as refrigerators and clothes washers are purchased year-round as customers' existing appliances reach the end of their useful lives or customers undertake home renovations. Based on this, it may make sense to consider establishing a year-round program in order to encourage purchases of energy efficient appliances at the time customers are in the market.

Findings and Recommendations for CFLs

Findings	Recommendations
PD:CFL-F1. With the approaching phase-out of incandescent bulbs in 2012, the PD program will need to drop rebates for regular CFLs. In 2010, specialty CFLs accounted for a lower proportion (9%) of CFLs sold through the program than in 2008 (18%) and 2009 (16%). Thus, the PD program fell short of its 2010 goal of 30% of all CFLs sold being specialty CFLs.	PD:CFL-R1. The DSM Administrator should start paring back on incentives for regular CFLs. Concomitantly, the program should shift to an increased focus on specialty CFLs and educating consumers about them. The program should continue offering markdowns on all sizes of specialty CFL packages. These markdowns are the most likely reasons for the proportional increase of specialty CFLs among participants' qualifying purchases.
PD:CFL-F2. In 2010, the program discontinued the majority of the educational components of the program including the in-store giveaway events. The 2009 program evaluation identified the in-store giveaway events as a strength of the program since they offered a good opportunity for consumers to try specialty CFLs and triggered a call to action for consumers. In addition, program staff believed these events may have even sparked additional sales of CFLs.	PD:CFL-R2. Based on the relative decrease in specialty CFL sales as a proportion of overall sales in 2010, NMR recommends that the future CFL programs consider including in-store giveaway events for specialty CFLs.
PD:CFL-F3. A number of program and non-program factors indicate that there is likely to be a substantial need to educate customers about proper disposal and to provide recycling for CFLs in Nova Scotia. These include existing high levels of awareness and CFL users, increases in sales and adoption due to the markdowns and exchanges, and the 2012 phase-out of incandescent bulbs. The PD program itself has been effective in motivating increased customer purchases of CFLs. Thus, there will be an increasing need to dispose of and recycle CFLs.	PD:CFL-R3. The PD program should work with retailers to develop/expand locations where consumers can dispose of CFLs for recycling. Prior to developing a recycling program, the DSM Administrator should develop baseline data on CFL disposals. Note that some retailers already offer facilities for CFL drop off recycling at retail store locations in Nova Scotia.

Findings and Recommendations for CFLs

Findings	Recommendations
PD:CFL-F4. As the 2012 date for phase-out of incandescent bulbs gets closer, there is likely to be some consumer hoarding of these bulbs.	PD:CFL-R4. The PD program should consider offering an incandescent bounty program that offers coupons or rebates upon turn-in of incandescent bulbs.
PD:CFL-F5. Anticipating having to drop regular CFLs from its lineup of rebated energy efficiency products, the PD program has sought other energy efficiency products to rebate and yield energy savings. LED technologies are still maturing but some mainstream applications are starting to enter the market, albeit still at a higher cost than CFLs.	PD:CFL-R5. The program should evaluate the opportunities for rebating LEDs (other than Christmas lights).
PD:CFL-F6. The PD program appears to have made substantial inroads into the CFL market and appears to have moved Nova Scotia residents higher on the diffusion curve for energy efficient lighting.	PD:CFL-R6. NMR recommends that the Program Administrator consider doing a socket saturation study in 2011. This will entail on-site visits to a random sample of households to collect data on socket counts and socket saturation as well as other information on lighting usage and behaviors. This can help understand and clarify the stage of the market on the diffusion curve for energy efficient lighting.
PD:CFL-F7. In both 2008 and 2009, based on feedback from program staff and retailers, NMR recommended that the DSM Administrator conduct a review of the overall marketing approach to increase the visibility and reach of program information and promotional materials. In 2010, the program was branded together with promotions for light fixtures, controls, and appliances as the 'Power Down' program. In addition, for 2010, program marketing began earlier and included: direct mail, radio and newspaper advertisement, inclusion of rebates and featured products in retailer flyers, and in-store signage. The results of these changes to marketing and outreach resulted in extremely high awareness and recall among both participants and non-participants. In contrast to both 2008 and 2009, 2010 participants (81%) and non-participants (86%) reported high levels of awareness of the program; and both participants (76%) and non-participants (69%) reported high levels of recall of program promotional materials.	PD:CFL-R7. The DSM Administrator should build on its 2010 marketing efforts to ensure that it continues to produce results in future program years. The program should consider developing a longer-term branding strategy to ensure high levels of awareness and participation.

Findings and Recommendations for CFLs

Findings	Recommendations
PD:CFL-F8. During an on-site store visit by an NMR representative, it was difficult to tell which specific items were discounted, especially for dimmers. For CFLs, all ENERGY STAR CFLs were discounted but even for these, the label did not tell customers to look for the ENERGY STAR logo. In a subsequent discussion with the program manager, NMR was told that each retailer had adapted the product tags and signage to their specific practices and, as a result, the program was not able to establish consistency in program signage and advertising.	PD:CFL-R8. To the extent possible, the program should reach agreements with participating retailers that will establish consistent advertising and signage. Recognizing that each retailer will also want to maintain control over and consistency with their own advertising and signage formats, the program should seek to establish minimum requirements regarding the informational content of such displays.

Findings and Recommendations for Fixtures, Controls, and Appliances

Findings	Recommendations
PD:F&C, APP-F1. While lighting products are often purchased in the fall, major appliances such as refrigerators and clothes washers are purchased year-round, most often when the existing appliance fails or homes are remodeled. As some retailers pointed out, major appliances are often not purchased at the end of the year when households are focused on holiday celebrations and gift-giving.	PD:F&C, APP-R1. Consider starting the program earlier in the year, to avoid conflicting with the end of year holiday season.
PD:F&C, APP-F2. Some retailers would have liked more advance notice of program implementation. One retailer said that more advance notice would have allowed him to order additional stock to ensure that items were available for purchase.	PD:F&C, APP-R2. Retailers need to be notified well in advance of program rollout, particularly if the program will include higher efficiency products that are in limited supply. Any notification should include specifics on the products that will be eligible for the program so that retailers can order additional stock. In addition to ensuring an adequate supply of the rebated products, notifying the retailers early allows them to promote the program in the local media.
PD:F&C, APP-F3. Some retailers believe the program would have benefited from more extensive marketing including: more advertising in smaller local newspapers, better signage, and in-store events. Although the Power Down program had generally high name recognition in the province, customers may not have been making the connection between the program and the products available in their local store.	PD:F&C, APP-R3. The program should consider increased targeted, local area marketing and visits from program representatives.

Findings and Recommendations for Fixtures and Controls

Findings	Recommendations
PD:F&C-F1. This study estimated high free ridership rates for all of the evaluated fixtures and controls products. This indicates that a large share of the rebated sales would have taken place in the absence of the program.	PD:F&C-R1. The program should consider dropping small products with high free-ridership rates such as indoor light timers. Instead, the program should consider a more intensive customer education campaign regarding the value and benefits of such technologies and energy efficiency in general.
PD:F&C-F2. Free ridership was estimated to be 60% for fixtures and, although not evaluated, is likely to be substantial for dimmers and programmable thermostats as well.	PD:F&C-R2. The Program Administrator should consider re-focusing its efforts for promoting these products to the new construction and major renovation market instead. Programmable thermostats may also be promoted in tandem with installations of new HVAC systems.

Findings and Recommendations for Appliances

Findings	Recommendations
PD:APP-F1. The conducted evaluation estimated high free-ridership rates for both the refrigerators (72%) and the clothes washers (85%) rebated through the PD program. This indicates that a large share of the rebated sales would have taken place in the absence of the program.	PD:APP-R1. Free-ridership rates can be lowered by rebating higher efficiency appliances only, such as models rated by the Consortium for Energy Efficiency (CEE) as Tier 3, which have much lower market penetration rates. Free-ridership rates may also be lowered by offering package deals where a consumer would have to purchase both a refrigerator and a clothes washer. This may induce households to replace an additional appliance with a high efficiency model once they are already in the market.
PD:APP-F2. Independent retailers were not originally included in the program and came on board a month after the program had started. Contrary to the expectations of the program implementer, some independent retailers saw a large percentage of sales.	PD:APP-R2. Retailers need to be notified well in advance of the program rollout, particularly if the program will include higher efficiency appliances that are in limited supply. In addition to ensuring an adequate supply of the rebated products, notifying the retailers early allows them to promote the program in the local media.

1 Program Description

This section presents the program description, program theory and logic model for the Power Down program (PD). Due to the broad nature of products covered by the Power Down program, we have divided the program description, program theory, and logic model into three distinct program components:

- CFLs;
- Light fixtures and controls
- Appliances

1.1 CFL: Program Description

The 2010 Power Down program began on October 1st, 2010 and ran through the end of November 2010. The program was administered by the implementation contractor and was called the “Power Down Discount” program in program literature. The program featured a discount on all ENERGY STAR®-qualified CFLs, ENERGY STAR® light fixtures, selected controls, and ENERGY STAR® appliances. This section of the report describes the results from the evaluation of the CFL portion of the program. Participating stores offering markdowns of CFLs included ten retail chains with 191 locations throughout Nova Scotia. There was one new retail participant in 2010, and there were only two retailers that did not to return from 2009. One of the retail chains utilized coupons provided at the register to apply the discount, while the other ten retail chains gave the markdowns automatically at the register at the time of purchase.

The program was promoted through in-store signage, flyers, store circulars, mailing cards, radio spots, information provided on the DSM Administrator’s and CNS’s websites, associate training, and associate contests. Unlike in 2008 and 2009, the program did not include any in-store events or an educational component.

1.1.1 CFL: Program Theory

The program logic model and program theory for the PD program was revised for 2010. The program theory and logic model are included below.

Program Background

The CFL component of the PD program is both a Resource Acquisition and a Market Transformation program operating in a market that is partially transformed for regular CFLs. In 2008, non-participant homes had an average of about eleven CFLs, in 2009 non-participant homes had an average of 13 CFLs and in 2010 non-participant homes had an average of nearly 14 CFLs. The long-term Market Transformation goal is not simply adoption of CFLs by homes in Nova Scotia, but complete saturation of all available sockets. From a Resource Acquisition perspective, as long as customers install program CFLs in sockets in Nova Scotia, the goal has been achieved. Research conducted by the DSM Administrator prior to designing the PD program revealed high CFL usage in the province: 80% of

residential customers said they used CFLs.⁸ Therefore, the CFL component of the PD program aims to encourage customers to “think beyond the mini-twister” and learn that there are specialty CFL bulbs for almost every application in the household. In the 2008 and 2009 program years, the program sought to achieve these goals by offering incentives only for ENERGY STAR-qualified multi-packs and specialty CFLs. In 2010, the program switched strategies and simply offered discounts and incentives for any ENERGY STAR-qualified CFLs regardless of type or pack size. The 2010 program utilized partnerships established with retailers throughout Nova Scotia to offer discounts on all ENERGY STAR-qualified CFLs.

Program Activities

- **Enlist retail partner support.** Participation in the CFL component of the program is channeled through retailers and a key focus of program activity is to establish partnerships with retailers. The PD program works with retailers to offer in-store marketing materials, point-of-sale discounts and in-store educational events. In addition, the program educates sales personnel about the program and its benefits.
- **Program support for retail stores.** Participating retailers receive program materials and training to implement the program. Training for employees covers program structure and benefits as well as invoicing for incentives.
- **Incentives and rebates.** The CFL component provides point-of-sale (POS) discounts to offset the cost of purchasing energy efficient compact fluorescent light bulbs at retailers throughout Nova Scotia. Buying down the cost of CFLs at POS has the advantage of making it easier for customers to receive their incentives and reduces the amount of processing required since retailers can provide one invoice for all POS rebates. The PD program provides coupons for stores where discounts cannot be automatically rung up at the cash register.
- **Customer education and outreach.** The PD program designs and distributes marketing materials to increase awareness among residential customers. Marketing efforts include radio, print, in-store signage, mail drop and the Internet.
- **Collaborative marketing.** In addition to utilizing traditional marketing channels, the program coordinates with retailers and other energy efficiency programs providers to promote the program.

Program Assumptions

- **Retail partners.** Retailer outreach activities will be sufficient to motivate retailers to partner with the program.
- **Marketing and outreach.** The program marketing and outreach materials will be accepted by the retailers and will increase program sales and lighting installations. Program marketing and outreach activities will generate sufficient customer awareness of the program and the CFL discounts to motivate increased purchases of qualifying CFLs.
- **Discounts.** The program discounts on CFLs will motivate customers to purchase more qualified CFLs than they would have in the absence of a discount.

⁸ Corporate Research Associates, Inc. (2007) *Nova Scotia Power Energy Efficiency Study*. Submitted, November 2007

- **Installation.** The CFLs purchased through the program will be installed in residential homes in Nova Scotia.
- **Availability of CFLs.** The above strategy and projections for uptake are based on retailers having sufficient CFL bulbs available for the Nova Scotia market.

Program Barriers

- **Awareness.** While it is not necessary that customers are aware of the program in order to participate, high levels of awareness may drive participation and achieve educational goals.
- **Saturation of CFLs.** High saturation levels of CFLs in the province may limit interest in purchasing CFLs and increase the likelihood of free-ridership.
- **Retailers.** Retailers are key to the success of the PD program. A lack of interest in or knowledge of the program could lead to poor participation by retailers and poor sales of program CFLs.

Short-Term Outcomes

- **Discounted CFLs available at participating retailers.** As a result of outreach activities, retailers partner with the PD program and offer POS rebates and promotional materials in their stores. Retail staff members understand how the program works and are trained to communicate benefits of energy efficiency to customers.
- **Customers are aware of the program.** Customers are made aware of the available discounts through marketing materials, such as in-store signage and direct mailings. Customers may also learn about the program through collaborative marketing efforts with other energy efficiency program providers. The program works with participating retailers to promote the program and disseminate other energy efficiency information.
- **Customers purchase energy efficient CFLs.** After becoming aware of the opportunities offered by the program, customers purchase ENERGY STAR CFLs.
- **Energy savings and bill reductions.** Energy savings are achieved when customers install CFLs in their homes.

Mid-Term Outcomes

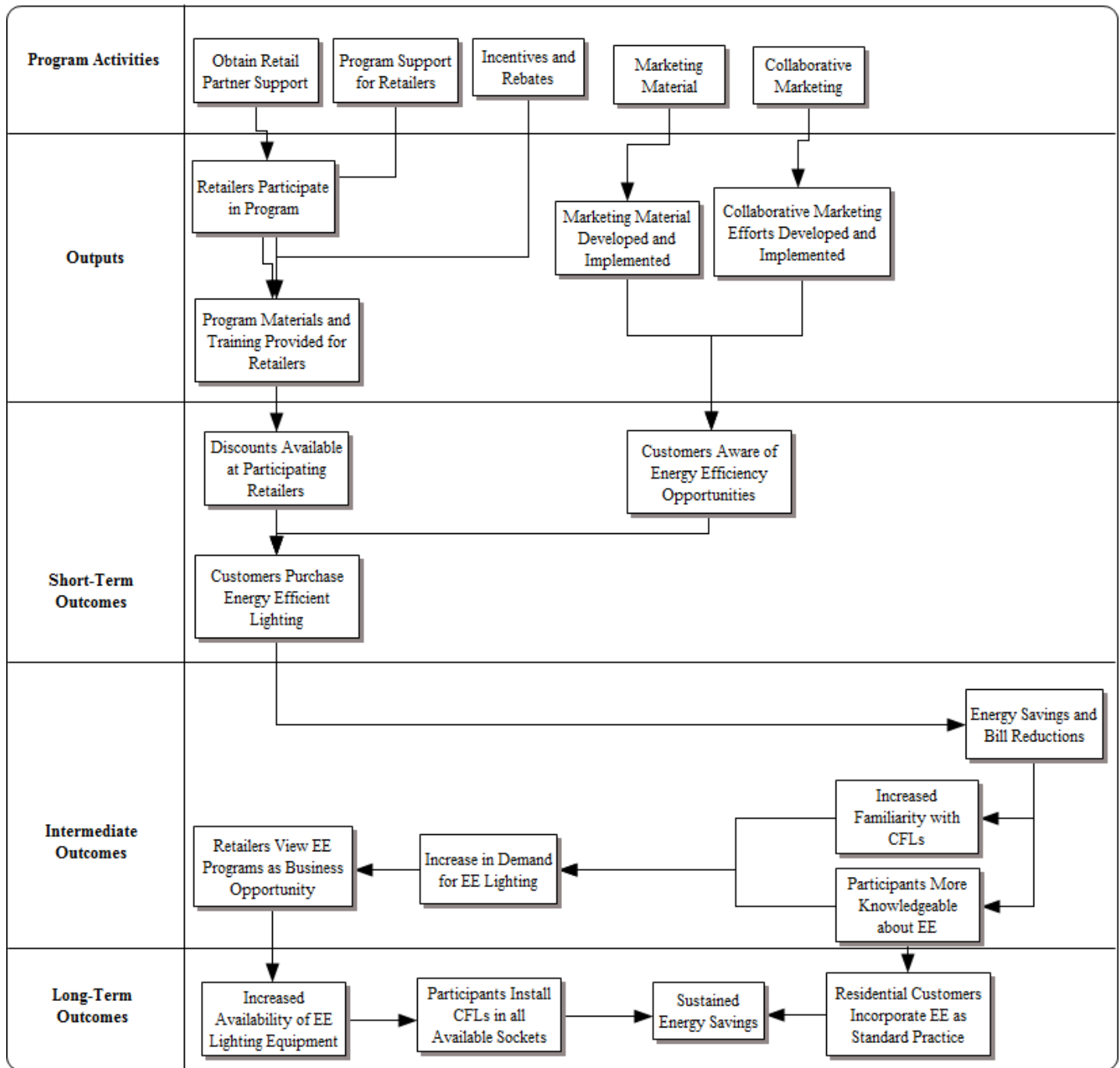
- **Participants are more knowledgeable about energy efficiency.** Participants gain first-hand understanding about the benefits of purchasing energy efficient equipment.
- **Increased comfort and knowledge about specialty CFLs.** Through the discount purchasing opportunities, participants gain first-hand understanding about the availability, quality, and benefits of specialty CFLs.
- **Increase in demand for energy efficient lighting equipment.** Participants who install energy efficient lighting recognize its benefits and continue to purchase energy efficient lighting.
- **Participating retailers recognize demand for energy efficient lighting equipment.** Retailers recognize the demand for energy efficient lighting equipment and as a result view energy efficiency programs as business opportunities. Retailers look for more opportunities to leverage energy efficiency programs and promote energy efficiency.

Long-Term Outcomes

- **Improved availability of energy efficient equipment.** Increased understanding of the benefits of energy efficiency and the sustained demand for energy efficient products result in more energy efficient lighting products being made available.
- **Residential customers incorporate energy efficient products and services as standard practices.** As a result of first-hand experience, efficient lighting products become standard practice for residential customers.
- **Sustained energy savings.** As a result of increased supply and demand for energy efficient lighting equipment, sustained energy savings are achieved in the residential market.

1.1.2 CFL: Program Logic Model

Figure 1-1: Power Down CFLs Logic Model



1.2 F&C: Program Description

The Light Fixtures and Controls (F&C) portions of the 2010 Nova Scotia Power Down (PD) program began on October 1st 2010 and ran through the end of November 2010. The program was administered by the implementation contractor and was called the “Power Down Discount Program” in program literature and promotions. The Light Fixtures and Controls portion was designed to achieve annual energy savings of 1,163,744 kWh through the promotion of ENERGY STAR indoor light fixtures, programmable thermostats for electric baseboard heaters, indoor lighting timers, heavy duty outdoor or pool timers, power bars with integrated timers, and dimmer switches.

Rebated sales of light fixtures and controls greatly exceeded these projections in the field. Rebates were paid for 8,061 ENERGY STAR indoor light fixtures, 7,383 programmable thermostats for electric baseboard heaters (single and multi-packs), 524 indoor lighting timers, 2,139 heavy duty outdoor or pool timers, 221 power bars with integrated timers, and 3,781 dimmer switches.

1.2.1 F&C: Program Theory

The program logic model and program theory for the PD program was revised for 2010. The program theory and logic model for the F&C components are included below.

Program Background

The F&C component of the PD program has both Resource Acquisition and Market Transformation goals. The long-term Market Transformation goal is to install energy efficient fixtures and controls in every home in Nova Scotia. From a Resource Acquisition perspective, as long as customers install the fixtures and controls in Nova Scotia, the goal has been achieved. In 2010, the program utilized partnerships established with retailers throughout Nova Scotia to offer markdowns on ENERGY STAR indoor light fixtures, programmable thermostats for electric baseboard heaters, indoor lighting timers, heavy duty outdoor or pool timers, power bars with integrated timers, and dimmer switches.

Program Activities

- **Enlist retail partner support.** Participation in the F&C components of the program is channeled through retailers and a key focus of program activity is to establish partnerships with retailers. The PD program works with retailers to offer in-store marketing materials, point-of-sale discounts and in-store educational events. In addition, the program educates sales personnel about the program and its benefits.
- **Program support for retail stores.** Participating retailers receive program materials and training to implement the program. Training for employees covers program structure and benefits as well as invoicing for incentives.
- **Incentives and rebates.** The F&C components provide point-of-sale (POS) discounts to offset the cost of purchasing energy efficient compact fluorescent light bulbs at retailers throughout Nova Scotia. Buying down the cost of fixtures and controls at POS has the advantage of making it easier for customers to receive their incentives and reduces the amount of processing required since retailers can provide one invoice for all POS rebates. The PD program provides coupons for stores where discounts cannot be automatically rung up at the cash register.

- **Customer education and outreach.** The PD program designs and distributes marketing materials to increase awareness among residential customers. Marketing efforts include radio, print, in-store signage, mail drop and the Internet.
- **Collaborative marketing.** In addition to utilizing traditional marketing channels, the program may coordinate with retailers and other energy efficiency programs providers to promote the program.

Program Assumptions

- **Retail partners.** Retailer outreach activities will be sufficient to motivate retailers to partner with the program.
- **Marketing and outreach.** The program marketing and outreach materials will be accepted by the retailers and will increase program sales and lighting installations. Program marketing and outreach activities will generate sufficient customer awareness of the program and the discounts to motivate increased purchases of qualifying fixtures and controls.
- **Discounts.** The program discounts on fixtures and controls will motivate customers to purchase more qualified fixtures and controls than they would have in the absence of a discount.
- **Installation.** The fixtures and controls purchased through the program will be installed in residential homes in Nova Scotia.
- **Availability of CFLs.** The above strategy and projections for uptake are based on retailers having sufficient fixtures and controls available for the Nova Scotia market.

Program Barriers

- **Awareness.** While it is not necessary that customers are aware of the program in order to participate, high levels of awareness may drive participation and achieve educational goals.
- **Retailers.** Retailers are key to the success of the PD program. A lack of interest in or knowledge of the program could lead to poor participation by retailers and poor sales of qualified fixtures and controls.

Short-Term Outcomes

- **Discounted fixtures and controls available at participating retailers.** As a result of outreach activities, retailers partner with the PD program and offer POS rebates and promotional materials in their stores. Retail staff members understand how the program works and are trained to communicate benefits of energy efficiency to customers.
- **Customers are aware of the program.** Customers are made aware of the available discounts through marketing materials, such as in-store signage and direct mailings. Customers may also learn about the program through collaborative marketing efforts with other energy efficiency program providers. The program works with participating retailers to promote the program and disseminate other energy efficiency information.
- **Customers purchase qualified fixtures and controls.** After becoming aware of the opportunities offered by the program, customers purchase qualified fixtures and controls.
- **Energy savings and bill reductions.** Energy savings are achieved when customers install qualified fixtures and controls in their homes.

Mid-Term Outcomes

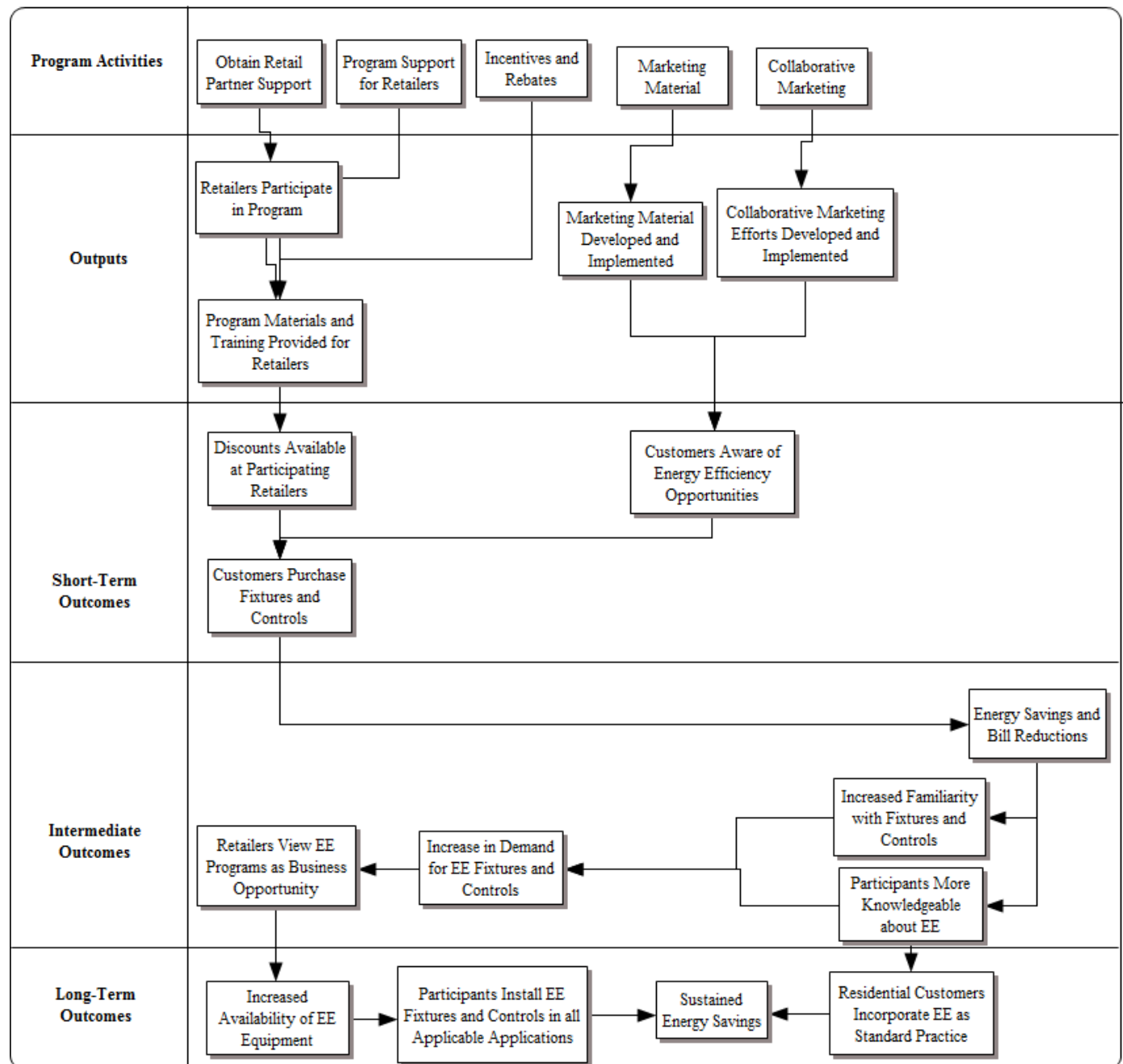
- **Participants are more knowledgeable about energy efficiency.** Participants gain first-hand understanding about the benefits of purchasing energy efficient equipment.
- **Increased comfort and knowledge about energy efficient fixtures and controls.** Through the discount purchasing opportunities, participants gain first-hand understanding about the availability, quality, and benefits of energy efficient fixtures and controls.
- **Increase in demand for energy efficient equipment.** Participants who install energy efficient equipment recognize its benefits and continue to purchase energy efficient equipment.
- **Participating retailers recognize demand for energy efficient equipment.** Retailers recognize the demand for energy efficient equipment and as a result view energy efficiency programs as business opportunities. Retailers look for more opportunities to leverage energy efficiency programs and promote energy efficiency.

Long-Term Outcomes

- **Improved availability of energy efficient equipment.** Increased understanding of the benefits of energy efficiency and the sustained demand for energy efficient products result in more energy efficient lighting products being made available.
- **Residential customers incorporate energy efficient products and services as standard practices.** As a result of first-hand experience, efficient lighting products become standard practice for residential customers.
- **Sustained energy savings.** As a result of increased supply and demand for energy efficient lighting equipment, sustained energy savings are achieved in the residential market.

1.2.2 F&C: Program Logic Model

Figure 1-2: Power Down Fixtures & Controls Logic Model



1.3 APP: Program Description

The Appliance Rebate portion (APP) of the 2010 Nova Scotia Power Down (PD) program began on October 1st 2010 and ran through the end of December 2010. The program was administered by the implementation contractor and was called the “Power Down Discount Program” in program literature. The APP portion was designed to achieve annual energy savings of 73,517 kWh through the promotion of ENERGY STAR refrigerators and clothes washers. The program offered \$50 rebates for these appliances at independent and chain retailers from October through December 2010.

Initially, APP was rolled out to chain retailers only. After hearing about the program, some independent retailers protested that the program was putting them at a competitive disadvantage and this resulted in their being added to the APP portion of the program in November. Independent retailers were allowed to apply for retroactive rebates on qualifying ENERGY STAR appliances, if the customer went back to retailer and requested the rebate in October; additionally, the program was extended through the end of December for appliances only at both chain and independent retailers.

Appliance rebates greatly exceeded these projections in the field. Rebates were paid for 2,191 refrigerators and 2,025 clothes washers. Over one-half of the sales were achieved through an extension of the program into December 2010; it had originally been scheduled to run only through October and November. Although the program was expanded to include independent retailers and extended to December, the program targets remained the same. In the in-depth interview, the implementation contractor’s program manager indicated that the budget was adjusted to include the new retailers and extension of the time of the program. Note that even if the program had not been thus expanded and extended, it would have comfortably exceeded program targets based only on the sales of clothes washers at R11 alone during any single month of the program period.

1.3.1 APP: Program Theory

The program theory and logic model for the APP portion of the 2010 Power Down program is described below.

Program Background

The APP component is both a Resource Acquisition and a Market Transformation program. The long-term Market Transformation goal is to install energy efficient appliances in every home in Nova Scotia. From a Resource Acquisition perspective, as long as customers install the appliances in Nova Scotia, the goal has been achieved. In 2010, the program utilized partnerships established with retailers throughout Nova Scotia to offer \$50 rebates on ENERGY STAR refrigerators and clothes washers.

Program Activities

- **Enlist retail partner support.** Participation in the APP component is channeled through retailers and a key focus of program activity is to establish partnerships with retailers. The program works with retailers to offer in-store marketing materials, point-of-sale discounts and in-store educational events. In addition, the program educates sales personnel about the program and its benefits.
- **Program support for retail stores.** Participating retailers receive program materials and training to implement the program. Training for employees covers program structure and benefits as well as invoicing for incentives.

- **Incentives and rebates.** The program provides point-of-sale (POS) discounts to offset the cost of purchasing ENERGY STAR refrigerators and clothes washers at retailers throughout Nova Scotia. Buying down the cost of these appliances at POS has the advantage of making it easier for customers to receive their incentives and reduces the amount of processing required since retailers can provide one invoice for all POS rebates.
- **Customer education and outreach.** The program designs and distributes marketing materials to increase awareness among residential customers. Marketing efforts include radio, print, in-store signage, mail drop and the Internet.
- **Collaborative marketing.** In addition to utilizing traditional marketing channels, the program coordinates with retailers to promote the program.

Program Assumptions

- **Retail partners.** Retailer outreach activities will be sufficient to motivate retailers to partner with the program.
- **Marketing and outreach.** The program marketing and outreach materials will be accepted by the retailers and will increase program sales. Program marketing and outreach activities will generate sufficient customer awareness of the program and the discounts to motivate increased purchases of ENERGY STAR refrigerators and clothes washers.
- **Discounts.** The program discounts on ENERGY STAR refrigerators and clothes washers will motivate customers to purchase these appliances at a greater rate than they would have in the absence of a discount.
- **Installation.** The ENERGY STAR refrigerators and clothes washers purchased through the program will be installed in residential homes in Nova Scotia.
- **Availability.** The above strategy and projections for uptake are based on retailers having sufficient ENERGY STAR refrigerators and clothes washers available for the Nova Scotia market.

Program Barriers

- **Awareness.** While it is not necessary that customers are aware of the program in order to participate, high levels of awareness may drive participation and achieve educational goals.
- **Customer Purchase Readiness.** Big ticket items such as refrigerators and clothes washers are typically purchased when customers are ready to replace an older or non-working appliance or when they are buying a new house. For some potential customers, these situations may not coincide with the narrow purchase window of the two or three month program period.
- **Retailers.** Retailers are key to the success of the program. A lack of interest in or knowledge of the program could lead to poor participation by retailers and poor sales of ENERGY STAR refrigerators and clothes washers.

Short-Term Outcomes

- **Discounted ENERGY STAR refrigerators and clothes washers available at participating retailers.** As a result of outreach activities, retailers partner with the program and offer POS rebates and promotional materials in their stores. Retail staff members understand how the program works and are trained to communicate benefits of energy efficiency to customers.

- **Customers are aware of the program.** Customers are made aware of the available discounts through marketing materials, such as in-store signage and direct mailings. Customers may also learn about the program through collaborative marketing efforts with other energy efficiency program providers. The program works with participating retailers to promote the program and disseminate other energy efficiency information.
- **Customers purchase ENERGY STAR refrigerators and clothes washers.** After becoming aware of the opportunities offered by the program, customers purchase ENERGY STAR refrigerators and clothes washers.
- **Customers see energy savings and bill reductions.** Energy savings are achieved when customers install ENERGY STAR refrigerators and clothes washers in their homes.

Mid-Term Outcomes

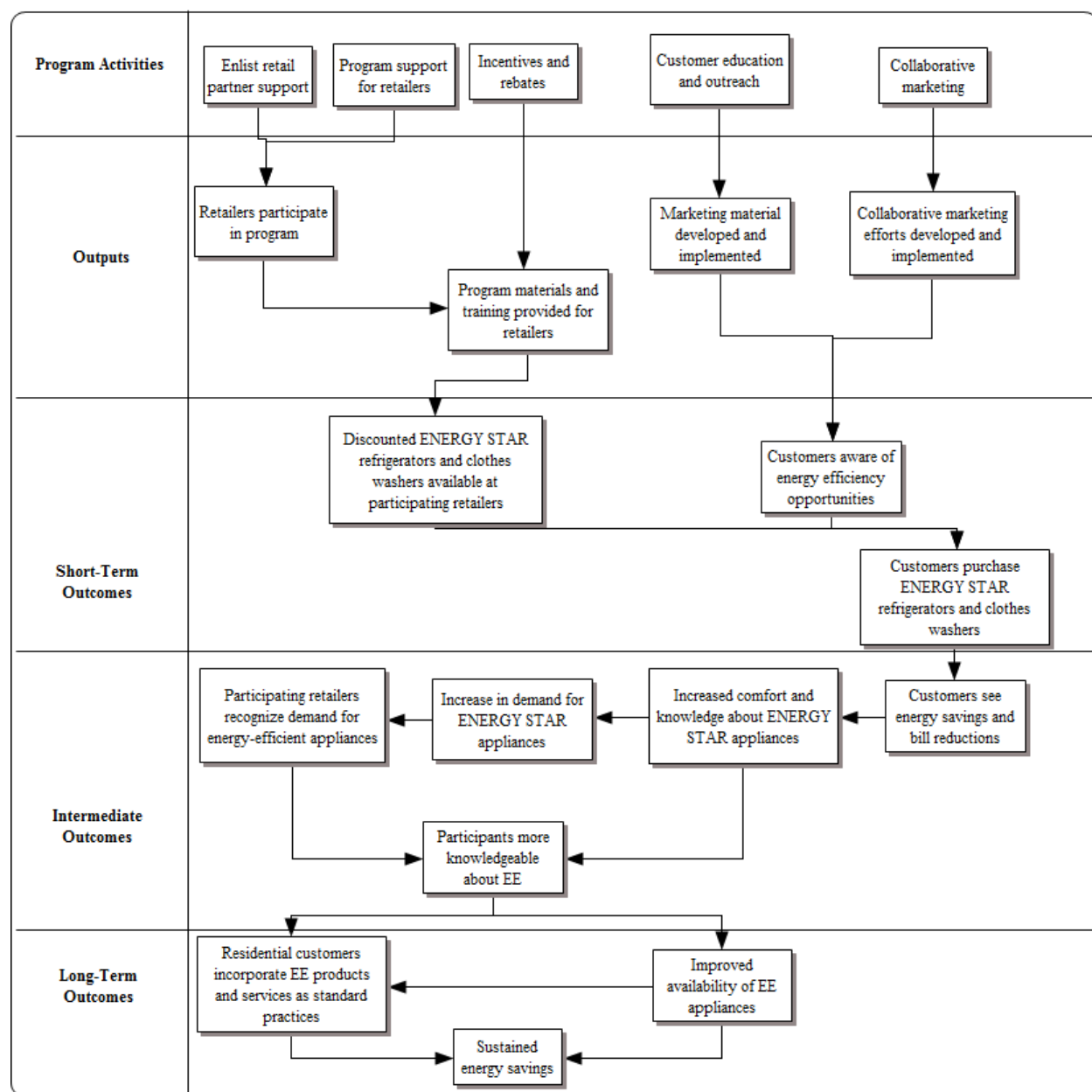
- **Participants are more knowledgeable about energy efficiency.** Participants gain first-hand understanding about the benefits of purchasing energy efficient appliances.
- **Increased comfort and knowledge about ENERGY STAR appliances.** Through the discount purchasing opportunities, participants gain first-hand understanding about the availability, quality, and benefits of ENERGY STAR appliances. They promote this and other program offerings.
- **Increase in demand for ENERGY STAR appliances.** Participants who install ENERGY STAR refrigerators and clothes washers recognize their benefits and continue to purchase energy efficient appliances.
- **Participating retailers recognize demand for energy efficient appliances.** Retailers recognize the demand for energy efficient appliances and as a result view energy efficiency programs as business opportunities. Retailers look for more opportunities to leverage energy efficiency programs and promote energy efficiency.

Long-Term Outcomes

- **Improved availability of energy efficient appliances.** Increased understanding of the benefits of energy efficiency and the sustained demand for energy efficient products result in more energy efficient appliances being made available.
- **Residential customers incorporate energy efficient products, equipment, appliances and services as standard practices.** As a result of first-hand experience, efficient equipment products, equipment, appliances, and services become standard practice for residential customers.
- **Sustained energy savings.** As a result of increased supply and demand for energy efficient products, equipment, appliances, and services, sustained energy savings are achieved in the residential market resulting in emissions reductions and avoidance of additional power plant capacity needs.

1.3.2 APP: Program Logic Model

Figure 1-3: Power Down Appliance Rebates Logic Model



2 Impact Evaluation: CFL Component

For the CFL component of the PD program, NMR integrated the sales data provided by the implementation contractor with participant and non-participant survey data to develop estimates of net participant sales that incorporated the effects of free-ridership and spillover. Using the difference of differences approach based on establishing a counterfactual, the formula for computing the net energy savings is as follows:

$$(Net\ Participant\ Sales) = (NTGR) \times (K)$$

And

$$NTGR = \frac{(B + C) - (Y) - (A - X)}{B}$$

Where,

NTGR = Net-to-Gross-Ratio

A = Participant average monthly CFL purchases per household (January – September 30th 2010)⁹

B = Participant average monthly CFL purchases per household through program (October 1st – November 30th 2010)

C = Participant average monthly CFL purchases per household outside program (October 1st – November 30th 2010)

X = Non-participant average monthly CFL purchases per household (January – September 30th 2010)

Y = Non-participant average monthly CFL purchases per household outside program (September 30th – November 30th 2010)

K = Number of program CFLs (October 1st 2010 through November 30th 2010)

Participants reported average monthly purchases of 3.45 CFLs during the program period, and an average of 12.6 CFLs in the past year. Non-participants reported average monthly purchases of 0.35 CFLs during the program period, and an average of 7.0 CFLs in the past year. NMR identified program purchases based on questions regarding the types of CFLs purchased and the stores where they were purchased. We accordingly estimated that participants purchased an average of 2.35 qualifying CFLs per month during the program period from participating retailers. Subtracting the CFLs purchased during the program period from the CFLs purchased in the past year yields a monthly average purchase of 0.48 CFLs for participants and 0.51 for non-participants in the nine months prior to the program period. The implementation contractor reported a total of 179,591 CFLs sold through the Power Down program as of January 24, 2011.

$$NTGR = \frac{(2.35 + 1.1) - (0.35) - (0.48 - 0.51)}{2.35} = 1.33$$

$$Net\ ENERGY\ STAR-qualified\ CFLs = (1.33) \times (179,591) = 238,856$$

⁹ Note that, since the discount was available only for ENERGY STAR-qualified CFLs, NMR adapted the questionnaire to determine the number of ENERGY STAR-qualified CFLs purchased and other CFL purchases.

For the following CFL energy and demand savings parameters, displaced wattage (45.7), winter coincidence factor on-peak (.220), annual hours of use (1,022), first year in-service rate (76.6%), and lifetime installation rate (97.4%), the NMR team used conservative savings estimation parameters from the 2009 NMR, RLW, GDS study of New England markdown programs. As in 2009, for the 2010 program year, several retailers provided specific sales information, including, in some cases, model numbers and wattages for CFLs sold as part of the program. Based on this data, NMR was able to develop estimates that validated the New England parameter for use in the energy and demand savings calculations for the CFL portion of the PD program. Based on the sales data provided by the retailers, NMR calculated an average displaced wattage of 47.87—practically identical to the New England displaced wattage parameter of 45.7 Watts. Appendix A includes the displaced wattage validation calculations and data.

Table 2-1: Energy and Demand Savings Estimation Parameters

	Markdown CFLs	Source
Total program sales	179,591	Program records
<i>Mini-twister CFLs</i>	162,843	<i>Program records</i>
<i>Specialty CFLs</i>	16,748	<i>Program records</i>
Net-to-gross ratio	1.33	Participant and non-participant questionnaires
Displaced wattage (CFLs)	45.70	New England markdown study; Validation based on program records
Winter coincidence factor on-peak (CFLs)	0.220 ¹⁰	New England markdown study
Annual hours of use (CFLs)	1,022	New England markdown study
First year installation rate (CFLs)	76.6%	New England markdown study
Lifetime installation rate (CFLs)	97.4%	New England markdown study
CFL measure life (years)	6.8	New England markdown study
Residential Line Loss Factor	11.88%	Nova Scotia Power, Inc

2.1.1 First-Year Estimated Energy and Demand Savings

The first-year estimated energy and demand savings at the meter are calculated using the following formulas:

First year energy savings calculations

CFLs:

$$\frac{(\text{net sales of all CFLs}) \times (\text{first year installation rate}) \times \left(\frac{\text{displaced wattage}}{\frac{1,000}{\text{kW}}} \right) \times (\text{annual hours of use})}{1,000 \text{ kWh/MWh}}$$

¹⁰ In the New England Markdown study, the average winter on-peak coincidence factor represents the percentage of operation during non-holiday weekdays from 5PM to 7PM in December and January.

$$\frac{(238,856) \times (76.6\%) \times \left(\frac{45.7 \text{ W}}{1,000 \text{ kW}} \right) \times (1,022 \text{ hours})}{1,000 \text{ kWh/MWh}} = 8,545 \text{ MWh}$$

First year demand savings calculations

CFLs:

$$(\text{net sales of all CFLs}) \times (\text{first year installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \text{ kW}} \right) \times (\text{winter coincidence factor})$$

$$[(238,856)] \times (76.6\%) \times \left(\frac{45.7 \text{ W}}{1,000 \text{ kW}} \right) \times (0.220) = 1,840 \text{ kW}$$

In order to estimate the total savings at the generator, the NMR team applied a line loss factor of 11.88% to the meter-level energy savings calculations for the first year savings.

Generator energy savings calculation

$$\text{Generator Savings} = (\text{Meter Energy Savings}) \times (1 + \text{Line Loss Factor})$$

Table 2-2: Program Estimated Annual Energy and Demand Savings

	Markdown CFLs
Gross sales of ENERGY STAR-qualified CFLs	179,591
Net-to-gross ratio	1.33
Net sales of ENERGY STAR-qualified CFLs	238,856
First year net energy savings at the meter (MWh)	8,545
First year net demand savings at the meter (kW)	1,840
First year net energy savings at the generator (MWh)	9,561
First year net demand savings at the generator (kW)	2,058

2.1.2 Lifetime Energy and Demand Savings

Lifetime energy and demand savings are presented for three possible scenarios based on future availability of incandescent lamps in Nova Scotia. The premise for the different scenarios is that incandescent lamps may be phased out in Canada (or some of the Canadian provinces) by 2012. Additionally, they are slated to be phased out by 2012 in the United States. As a result, whether through regulation or practice, general-service incandescent lamps may be unavailable in Nova Scotia after 2012. Under such circumstances, the CFL component of the PD program may be able to claim only one year of the total lifetime savings for CFLs installed through the program. Accordingly, the first scenario assumes that no new standards or regulations are implemented and the program can claim the savings associated with the full life of all of the CFLs.¹¹ In this scenario, lifetime energy savings are calculated using the lifetime installation rate (97.4%) and the measure life (6.8 years).

Scenario One – Lifetime energy savings calculations

$$\frac{(\text{net sales}) \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{measure life}) \times (\text{annual hours of use})}{1,000 \text{ kWh/MWh}}$$

$$\frac{(238,856) \times (97.4\%) \times \left(\frac{45.7 \text{ W}}{1,000 \frac{W}{kW}} \right) \times (6.8 \text{ years}) \times (1,022 \text{ hours})}{1,000 \text{ kWh/MWh}} = 73,888 \text{ MWh}$$

Scenario One – Lifetime demand savings calculations

$$(\text{net sales}) \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{winter coincidence factor})$$

$$(238,856) \times (97.4\%) \times \left(\frac{45.7 \text{ W}}{1,000 \frac{W}{kW}} \right) \times (0.220) = 2,339 \text{ kW}$$

¹¹ Note that in their review of the 2008 evaluation, the Nova Scotia Utility and Review Board's Savings Verification Consultants asserted that this is the most likely scenario since they "expect that CFLs already in place at the end of 2008 will retain full value for their remaining equipment life since it is likely that existing household stocks and stocks remaining in storage in distribution channels will mean that incandescent bulbs will be available through the life of CFLs installed in the 2008 program."

The second scenario, which is the most conservative, assumes that new minimum energy performance standards are implemented in Nova Scotia for general-service lamps going into effect in 2012. Canada's Energy Efficiency Regulations were amended to include such standards in December 2008.¹² In this scenario, the program can claim only one year of the lifetime savings. In this scenario the lifetime savings are equal to the first year energy savings as outlined previously.

The third scenario assumes that new minimum energy performance standards are implemented in Nova Scotia but that the standards do not include specialty bulbs. In this scenario, the program can claim only one year of the lifetime savings for regular (mini-twister CFLs) and the full savings for specialty CFLs. Correspondingly, the installation rate for regular CFLs is the same as the first year installation rate (76.6%). The lifetime energy savings for regular CFLs therefore are calculated using a first year installation rate for regular CFLs and the lifetime installation rate from scenario one for specialty CFLs.

Scenario Three – Lifetime energy savings calculations

Regular CFL Lifetime Savings

$$= \frac{(\text{net regular CFL sales}) \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{measure life}) \times (\text{annual hours of use})}{1,000 \text{ kWh/MWh}}$$

+

Specialty CFL lifetime Savings

$$= \frac{[(\text{net specialty CFL sales})] \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{measure life}) \times (\text{annual hours of use})}{1,000 \text{ kWh/MWh}}$$

$$\text{Regular CFL lifetime Savings} = \frac{(216,581) \times (76.6\%) \times \left(\frac{45.7}{1,000 \frac{W}{kW}} \right) \times (1 \text{ year}) \times (1,022)}{1,000 \text{ kWh/MWh}} = 7,748 \text{ MWh}$$

+

$$\text{Specialty CFL lifetime Savings} = \frac{[22,275] \times (97.4\%) \times \left(\frac{45.7}{1,000 \frac{W}{kW}} \right) \times (6.8 \text{ years}) \times (1,022)}{1,000 \text{ kWh/MWh}} = 6,890 \text{ MWh}$$

$$7,748 \text{ MWh} + 6,890 \text{ MWh} = 114,639 \text{ MWh}$$

¹² <http://oee.nrcan-rncan.gc.ca/regulations/bulletin/general-service-lamps-dec08.cfm?attr=4>

Scenario Three – Lifetime demand savings calculations*Regular CFL demand savings*

$$= (\text{net regular CFL sales}) \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{winter coincidence factor on-peak})$$

Specialty CFL demand savings

$$= [(\text{net specialty CFL sales}) + (\text{giveaways})] \times (\text{lifetime installation rate}) \times \left(\frac{\text{displaced wattage}}{1,000 \frac{W}{kW}} \right) \times (\text{winter coincidence factor on-peak})$$

$$\text{Regular CFL demand savings} = (179,591) \times (76.6\%) \times \left(\frac{45.7 W}{1,000 \frac{W}{kW}} \right) \times (0.220) = 1,668 kW$$

$$\text{Specialty CFL demand savings} = [22,275] \times (97.4\%) \times \left(\frac{45.7 W}{1,000 \frac{W}{kW}} \right) \times (0.220) = 218 kW$$

$$1,668 kW + 218 kW = 1,886 kW$$

In order to estimate the total savings at the generator, the NMR team applied a line loss factor of 11.88% to the meter-level energy savings calculations for the first year savings and each of the three lifetime savings scenarios.

Generator energy savings calculation

$$\text{Generator Savings} = (\text{Meter Energy Savings}) \times (1 + \text{Line Loss Factor})$$

Table 2-3: CFL Component Estimated Energy and Demand Savings

	Markdown CFLs
Gross sales of all ENERGY STAR-CFLs	179,591
Net-to-gross ratio	1.33
Net sales of CFLs	238,856
First year net energy savings at the meter (MWh)	8,545
First year net demand savings at the meter (kW)	1,840
Lifetime net energy savings at the meter – scenario one (MWh)	73,888
Lifetime net demand savings at the meter – scenario one (kW)	2,339
Lifetime net energy savings at the meter – scenario two (MWh)	8,545
Lifetime net demand savings at the meter – scenario two (kW)	1,840
Lifetime net energy savings at the meter – scenario three (MWh)	14,639
Lifetime net demand savings at the meter – scenario three (kW)	1,886
First year net energy savings at the generator (MWh)	9,561
First year net demand savings at the generator (kW)	2,058
Lifetime net energy savings at the generator – scenario one (MWh)	82,665
Lifetime net demand savings at the generator – scenario one (kW)	2,617
Lifetime net energy savings at the generator – scenario two (MWh)	9,561
Lifetime net demand savings at the generator – scenario two (kW)	2,058
Lifetime net energy savings at the generator – scenario three (MWh)	16,378
Lifetime net demand savings at the generator – scenario three (kW)	2,110

2.1.3 Interactive Effects

For the 2010 evaluation, the NMR team sought to estimate the impact of interactive effects for the CFL portion of the PD program. In the context of energy savings analysis, the term “interactive effect” refers to a related change in another devices’ electrical use, as influenced by the implementation of an energy conservation measure on a given piece of equipment. The term typically refers to the interaction between a measure installation and the local heating and cooling systems, as reductions in electrical energy use within a conditioned space naturally result in reduced heat gains to the space. In conditioned spaces, this reduced heat gain translates into lower cooling load and higher heating load, which would then be compensated for by the facility HVAC systems.

Interactive savings estimates were calculated using the measure-specific demand reductions to determine the change in heat gains to the space. The calculation can be complex and fixture-specific or basic and facility-specific, depending upon the objectives of the study. For this evaluation, analysts utilized simplified engineering methods to produce reliable and conservative estimates of HVAC interaction. Fundamentally, interactive effects for lighting are functions of the direct lighting kW reduction, measured coincidence factors, empirical interaction factors and cooling and heating system efficiencies. The interactive savings quantity is positive for electric cooling interaction and negative for electric heating interaction. For this evaluation, in an effort to be as conservative as possible, the positive electric cooling interactive effects were assumed to be zero. To calculate the heating interaction impacts the following formulas were used:

$$\text{Heating kWh Energy Impact} = \frac{(\text{Estimated kWh Savings}) \times (\% \text{ of Space Heated}) \times 0.15}{(\text{Heating System COP})}$$

Where,

0.15 is the energy interaction factor between the lights and the heating system.

$$\text{Heating kW Demand Impact} = \frac{(\text{Estimated Peak kW Savings}) \times (\% \text{ of Space Heated}) \times 0.133}{(\text{Heating System COP})}$$

Where,

0.133 is the demand interaction factor between lights and heating system at 5-6 PM.

In our streamlined computations, we utilized a coefficient of performance (COP) of 1.0¹³ for all electric heating systems and assumed that 30%¹⁴ of homes in Nova Scotia were electrically-heated. Table 2-4 shows the results of these calculations at the meter and at the generator.

Table 2-4: CFL Component Estimated Net Energy and Demand Savings with Interaction

	Without Interaction		With Interaction	
	Peak Demand (kW)	Energy (MWh)	Peak Demand (kW)	Energy (MWh)
Net Savings				
First year	2,058	9,561	1,976	9,130
Lifetime Energy Savings				
Scenario One at the generator	2,617	82,665	2,512	78,945
Scenario Two at the generator	2,058	9,561	1,976	9,130
Scenario Three at the generator	2,110	16,378	2,026	15,641

¹³ To be as conservative as possible the NMR team assumed a COP equivalent to that of an electric resistance heating system.

¹⁴ As per the DSM Administrator

3 Impact Evaluation: Fixtures and Controls Components

The Power Down program (PD) ran from October 1st, 2010 through the end of November 2010. The program provided rebates at the retail level for fixtures and controls including:

- ENERGY STAR qualified indoor light fixtures
- Programmable thermostats for electric baseboard heaters
- Indoor light timers (hard-wired)
- Outdoor/heavy duty timers
- Dimmer switches
- Power bars with integrated timers

The NMR team used evaluation databases such as the California Measurement Advisory Council (CALMAC) and Consortium for Energy Efficiency (CEE) databases to identify previous research conducted on these measures.^{[15][16]} Using databases such as these, we reviewed a variety of secondary sources to assess the validity of the program's current savings assumptions for all of these measures. This section presents a review of these studies and the adjusted program savings for the F&C component of the PD program based on our evaluation.

After reviewing the program's tracking database, it appears that the program's savings estimates are all based on the Ontario Power Authority (OPA) report titled "2010 Prescriptive Measures and Assumptions".¹⁷ This is reasonable as the OPA report offers savings estimates for each of the products rebated through the PD program.

3.1 ENERGY STAR Qualified Indoor Light Fixtures

NMR reviewed five different sources to determine whether or not the program's current savings assumption for ENERGY STAR qualified indoor light fixtures is reasonable. The program currently assumes that every ENERGY STAR qualified indoor light fixture results in annual savings of 125.27 kWh. We reviewed the following studies to assess this value:

- Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.
- RLW Analytics (2004). *Measurement and Evaluation Study of the 2003 SDG&E Residential Hard-to-Reach Lighting Program*. November, 2004.
- Opinion Dynamics Corporation (2006). *The New Hampshire Electric Utilities' Low-income Retrofit Program—Impact Evaluation*. January 16, 2006.

¹⁵ <http://www.calmac.org/search.asp>

¹⁶ <http://www.cee1.org/search/search.php>

¹⁷ Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.

- Quantec (2004). *Residential New Construction High Efficiency Appliance Lighting: End of Year Assessment*. April, 2004.¹⁸
- NMR and RLW (2007). *Process and Impact Evaluation of the Efficiency Maine Lighting Program*. April, 2007.

The program's current savings value is based on the OPA report, and the savings reflect ceiling mounted indoor light fixtures. The OPA's savings estimate assumes that two 60 Watt incandescent bulbs are replaced by two 15 Watt CFL bulbs and are operated for 3.9 hours per day (1,423.5 hours per year).

As part of an evaluation for the Efficiency Maine Lighting Program, NMR evaluated the per unit savings of ENERGY STAR qualified interior light fixtures. NMR selected this study for our evaluation because it was conducted relatively recently (2007) in a region with similar seasonal daylight patterns to Nova Scotia. Based on a telephone survey with participants, the NMR team estimated daily usage of interior fixtures at 2.4 hours (1.9 hours in the summer and 2.9 hours in the winter). Through a sample of on-site visits NMR found that program rebated interior light fixtures had an in-service rate of 79%; that is, 79% of the fixtures rebated by the program had actually been installed. The on-site visits also showed that the average displaced wattage from the rebated fixtures was 50 Watts. Using the equation below, the NMR team developed annual gross per unit savings estimates for interior fixtures of 34 kWh.

$$\frac{\text{Displaced Wattage} \times \left(\frac{\text{Hours of Use}}{\text{Day}} \right) \times \left(\frac{\text{Days}}{\text{Year}} \right) \times \text{In-service Rate}}{1000 \text{ Watts}}$$

NMR applied the annual savings value identified in the NMR report of 34 kWh per unit to estimate program savings attributable to the DSM Administrator.

The program rebated 8,061 ENERGY STAR qualified indoor light fixtures, resulting in evaluated savings of 274,074 kWh—a 73% decrease in savings compared to the program's tracking database. There are a few reasons for the differences in savings estimates:

- The current program estimates are based on fixtures which replace two 60 Watt bulbs with two 15 Watt CFLs—the NMR report is based on one bulb replacement.
- The estimated daily hours of use are lower in the NMR estimate than the OPA estimate.
- The NMR report includes an in-service rate accounting for rebated products that are not currently installed—the OPA report does not make this adjustment.

¹⁸ This report was prepared for D&R International who implemented the program for San Diego Gas and Electric in 2003.

Using the equations below we determined that the indoor light fixtures rebated through the program resulted in demand savings of 70.1 kW. (Table 3-1)

$$\begin{aligned}
 & (\text{net sales of all fixtures}) \times (\text{first year installation rate}) \times \left(\frac{\text{displaced Wattage}}{\frac{1,000}{\text{kW}}} \right) \times (\text{winter coincidence factor}) \\
 & (8,061) \times (79\%) \times \left(\frac{50 \text{ W}}{\frac{1,000}{\text{kW}}} \right) \times (0.220) = 70.1 \text{ kW}
 \end{aligned}$$

Table 3-1: Tracked and Evaluated Savings—ENERGY STAR Qualified Indoor Light Fixtures

	Tracked	Evaluated
Number of units	8,061	8,061
Savings per unit (kWh)	125.27	34
Total savings (kWh)	1,009,801	274,074
Demand savings (kW)	n/a	70.1

3.2 Controls

As previously mentioned, all of the program’s savings estimates are based on the OPA report. NMR was unable to find secondary sources with more suitable savings estimates for any of the “controls” measures rebated through the program. This section details the reports we reviewed, and outlines the assumptions made by the OPA for their savings estimates.

3.2.1 Programmable Thermostats for Electric Baseboard Heaters

The program currently estimates that programmable thermostats for electric baseboard heaters save 63.15 kWh per year for each electric baseboard. NMR reviewed three studies to determine whether or not these savings estimates are accurate. The three studies we reviewed are listed below:

- Quantec (2004). *Final EM&V Report for South Bay energyrewards Program*. June 7, 2004.
- Opinion Dynamics Corporation (2006). *The New Hampshire Electric Utilities’ Low-income Retrofit Program—Impact Evaluation*. January 16, 2006.
- Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.

Both the Quantec and Opinion Dynamics Corporation (ODC) reports estimated savings for programmable thermostats, but these estimates were not specific to electric baseboard heaters. Quantec applied a net-to-gross ratio of 0.80 to program tracking data to estimate savings for programmable thermostats of 3,750 kWh per thermostat. ODC used the Targeted Retrofit Energy Analysis Tool (TREAT) to model the impacts of programmable thermostats, and ultimately estimated the annual savings per thermostat to be 814 kWh. Each of these values is substantially higher than the program’s current assumption of 63.15

kWh, likely because these studies did not focus on programmable thermostats for electric baseboard heating.¹⁹

Electric baseboard heating is not nearly as common in the United States as it is in Canada, for this reason the results from the Quantec and ODC reports are largely based on central gas or oil heating systems. Programmable thermostat savings associated with central heating systems are often significantly higher than savings based on electric baseboard heating. One programmable thermostat can control an entire central heating system resulting in high energy savings per unit.²⁰ Programmable thermostats, when used to control electric baseboard heating, often can only be applied to one electric baseboard unit—homes generally have one unit per room. For this reason, the savings from programmable thermostats with electric baseboard heating are significantly lower as they are only controlling the heating load for one room.

The OPA report estimates savings for programmable thermostats with electric baseboard heating. Based on a participant survey the OPA found that 27% of participants used electric baseboard as their primary heating source, with approximately five electric baseboards per home, and 73% of participants used baseboard as supplementary heat, with approximately 2 baseboards per home. Assuming 1% savings for every degree Celsius setback from the programmable thermostat the OPA estimates saving of 63.15 kWh per electric baseboard—the same value the program currently uses.

Based on our research, we found that the current program assumption of 63.15 kWh per electric baseboard is reasonable. This value is based on the OPA report, and is the most accurate estimate of savings that we reviewed.

According to the program's tracking database the PD program rebated 7,383 programmable thermostats between October and November of 2010, resulting in savings of 466,236 kWh—we believe these savings estimates are accurate and do not recommend any changes. (Table 3-2)

Table 3-2: Tracked and Evaluated Savings—Programmable Thermostats

	Tracked and Evaluated
Number of units	7,383
Savings per unit (kWh)	63.15
Total savings (kWh)	466,236

3.2.2 Indoor Light Timers

The program currently assumes that indoor light timers result in savings of 219 kWh per unit. Based on a review of the OPA report, the NMR team determined that the current program savings estimate is reasonable for indoor light timers.²¹

The OPA estimates are based on a 2007 report evaluating their “Every KiloWatt Counts Program.”²² The OPA savings estimates assume a 200 Watt fixture (two 100 Watt incandescent bulbs) decreases usage

¹⁹ TREAT is a residential energy simulation tool similar to the REM/Rate and HOT2000 software's.

²⁰ Programmable thermostat savings are strongly influenced by occupant behavior.

²¹ NMR was unable to find any other research that estimated savings for indoor light timers.

²² Navigant (2008). *Final Evaluation Report: 2007 Every KiloWatt Counts Program*. June 17, 2008.

from five hours to two hours per day as a result of an indoor light timer. As the OPA notes, the savings from an indoor light timer are inherently behavioral, and their estimates are based on the assumption that participants would decrease the usage of a 200 Watt fixture from five to two hours.

The program rebated a total of 524 indoor light timers, resulting in savings of 114,756 kWh. The evaluation team does not recommend a change to these savings estimates. (Table 3-3)

Table 3-3: Tracked and Evaluated Savings—Indoor Light Timers

	Tracked and Evaluated
Number of units	524
Savings per unit (kWh)	219
Total savings (kWh)	114,756

3.2.3 Outdoor/Heavy Duty Timers

The NMR team reviewed two reports to determine whether or not the program's current savings estimate for heavy duty timers (for pool pumps) of 383.65 kWh per unit is reasonable. We reviewed the following reports:

- ADM (2002). *Evaluation of Year 2001 Summer Initiatives Pool Pump Program*. April, 2002.
- Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.

While the ADM report looked at heavy duty timers for pool pumps, the program being evaluated was focused on shifting when pool pumps ran as opposed to how frequently they ran. Therefore, the ADM report was not directly applicable to the PD program.

The OPA report assumes that installing a heavy duty timer will result in a reduction in pool pump operation from ten to six hours per day.²³ This is reasonable as we found multiple sources citing six hours per day as a reasonable reduced operating time for pool pumps.^{[24][25]} Assuming this reduction in usage, an annual operating time of 90 days, and a 1.0 Horsepower pool pump, the OPA estimates that a heavy duty timer saves 383.65 kWh per year. The assumptions used in the OPA's calculations appear to be reasonable, so NMR suggests that the tracked savings estimates remain the same.

Between October and November of 2010, the PD program rebated 2,139 heavy duty timers resulting in program savings of 820,627 kWh. (Table 3-4)

Table 3-4: Tracked and Evaluated Savings—Outdoor/Heavy Duty Timers

	Tracked and Evaluated
Number of units	2,139
Savings per unit (kWh)	383.65
Total savings (kWh)	820,627

²³ Once again this is a highly behavioral technology and these savings depend on occupants adjusting the timer to operate at six hours per day.

²⁴ http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13290

²⁵ https://wrve.opower.com/ei/app/tip/tip122_reduce_pool_pump_run-time

3.2.4 Dimmer Switches

The program's current savings assumptions for dimmer switches are based on the OPA's report. The OPA report assumes that the dimmer switch controls two 60 Watt incandescent bulbs. The dimmer switch is used to dim the bulbs by 25%, resulting in 20% electricity savings. This is the only report NMR could find with specific savings estimates for dimmer switches. For this reason we assume that the current program savings assumption of 23.65 kWh per unit is reasonable.

The PD program rebated a total of 3,781 dimmer switches, resulting in program savings of 89,421 kWh. (Table 3-5)

Table 3-5: Tracked and Evaluated Savings—Dimmer Switches

	Tracked and Evaluated
Number of units	3,781
Savings per unit (kWh)	23.65
Total savings (kWh)	89,421

3.2.5 Power Bars with Integrated Timers

As is the case with all of the control measures, the program's current savings assumptions for power bars with integrated timers are based on the OPA's report. The OPA report is the only source we could find that developed specific savings estimates for power bars with integrated timers. Therefore, we suggest the program continue to use a savings value of 53.39 kWh per power bar.

The OPA made a wide range of assumptions regarding electronics and usage to develop savings for power bars with integrated timers, ultimately estimating savings of 53.39 kWh per unit.²⁶

The PD program rebated a total of 221 power bars with timers, resulting in savings of 11,799 kWh. (Table 3-6)

Table 3-6: Tracked and Evaluated Savings—Power Bars with Integrated Timers

	Tracked and Evaluated
Number of units	221
Savings per unit (kWh)	53.39
Total savings (kWh)	11,799

²⁶ Entertainment electronics, computer equipment, lighting, and other electrical equipment all impacted the estimated savings for power bars with integrated timers.

3.3 Gross Impacts—Fixtures and Controls

Table 3-7 displays a comparison of the tracked and evaluated savings by measure. ENERGY STAR indoor qualified light fixtures provided the most savings in the tracking database (1,010 MWh at the meter), while outdoor/heavy duty timers provided the most savings under the evaluated estimates (821 MWh at the meter). Power bars with timers and dimmer switches had the smallest impact on overall program savings.

Table 3-7: Detailed Comparison of Savings

	N	Tracked		Evaluated		
		Meter (MWh)	Generator (MWh)	Meter (MWh)	Generator (MWh)	Percent Change from Tracked
ES indoor light fixtures	8,061	1,010	1,130	274	307	-73%
Programmable thermostats	7,383	466	522	466	522	0%
Indoor light timers	524	115	128	115	128	0%
Outdoor/heavy duty timers	2,139	821	918	821	918	0%
Dimmer switches	3,781	89	100	89	100	0%
Power bars with timers	221	12	13	12	13	0%
Total	22,109	2,513	2,811	1,777	1,988	-29%

We calculated the demand savings for controls by obtaining the ratio of all residential target peak demand savings to target energy savings for the Efficient Products—Retail Program. This ratio was taken from the adjusted 2010 DSM Targets per the UARB Approved Settlement Agreement. The demand savings for ENERGY STAR qualified indoor light fixtures were calculated separately and were found to be 70.1 kW. Based on an energy-to-demand ratio of 4.8 we calculated demand savings for each of the control categories at the generator. (Table 3-8)

Table 3-8: Gross Energy and Demand Savings by Measure

	Gross Savings at Generator	
	Demand (kW)	Energy (MWh)
ES indoor light fixtures	70.1	307
Programmable thermostats	108.8	522
Indoor light timers	26.7	128
Outdoor/heavy duty timers	191.3	918
Dimmer switches	20.8	100
Power bars with timers	2.7	13
Total	420.4	1,988

3.4 Free-ridership and Spillover

3.4.1 Retail Survey Questions

In order to determine the magnitude of free-ridership and spillover, retailers were asked a series of questions related to their sales of fixtures and controls before, during and after the Power Down program promotion. While designing the retailer survey questionnaire, NMR estimated that the retail store managers would not be willing to allocate any more than 20 minutes on the phone responding to the survey. Asking questions about all of the measures would have resulted in a very long survey and it would have been very difficult to keep retail store managers on the phone for that long. Accordingly, NMR reviewed the implementation contractor's projected savings for all of the measures and decided to include only measures with the higher projected savings in the store manager survey: ENERGY STAR light fixtures, power bars with timers, indoor light timers, and heavy duty pool/outdoor timers. Correspondingly, NMR made the decision that the evaluation would allow the program to claim the full gross savings estimates for the measures with the lower projected savings.²⁷ The implementation contractor projected that dimmer switches and thermostats would have the lowest savings. Accordingly, free-ridership was not estimated for these measures and the Power Down program was allowed to claim the full gross savings from the rebated sales of these measures.

For each of the measures included in the questionnaire, the retailers who reported higher relative sales during the Power Down promotion were asked to estimate the percentage of the higher sales that they attributed to the program. Additionally, retailers were reminded about the amount of the rebate for each measure and asked if, in the absence of this program rebate, their sales would have been the same, lower, or higher. Retailers, who said that their sales would have been lower in the absence of the program, were asked to indicate the percentage that their sales would have been lower. As a final question, retailers were asked to rate how important the rebate from the Power Down Program was to customers' decisions to purchase each measure. These questions are shown in the following table. (Table 3-9)

²⁷ An alternative approach would have been to take an average of the free-ridership percentage obtained for the other controls.

Table 3-9: Free-ridership and Spillover Estimation Questions

Percentage of Sales
Roughly what percent of ALL [MEASURE CATEGORY] that your store sold between January and September 2010, BEFORE the Power Down program promotion, were [MEASURE NAME] that were later rebated by the program?
Now thinking of your sales of [MEASURE CATEGORY] DURING the Power Down promotion in October and November 2010, roughly what percent of ALL [MEASURE CATEGORY] that your store sold were [MEASURE NAME] that were rebated by the Power Down program?
And roughly what percent of ALL the [MEASURE CATEGORY] that your store sold in December 2010, AFTER the program promotion period, were [MEASURE NAME] that had previously been rebated by the program?
Finally, thinking back to your 2009 sales, roughly what percent of all the [MEASURE CATEGORY] that your store sold in October and November OF 2009 were [MEASURE NAME] that were later rebated by the Power Down program?
Program Attribution Percentage
You just indicated that the percentage sales of [MEASURE CATEGORY] that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates?
You just indicated that the percentage sales of [MEASURE CATEGORY] that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates?
You just indicated that the percentage sales of [MEASURE CATEGORY] that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates?
[IF POST-PROGRAM SALES >= 0%]: How many more months do you expect this follow-on effect of the program will last?
Sales in Absence of Program
During the October-November promotion, the Power Down program provided a rebate of \$XX for each [MEASURE NAME] sold in your store. If this rebate had not been available, do you think your October-November sales of [MEASURE NAME] would be about the same, lower, or higher?
What percentage do you estimate your store's sales of these [MEASURE NAME] would have been lower during the October-November promotion period if the \$XX Power Down program rebate had not been available?
I want to make sure I understand you correctly when you say your store's sales of [MEASURE NAME] would be [% FROM ABOVE QUESTION] lower without the Power Down program rebate. So you're saying that if you sold 100 [MEASURE NAME] in a given week with the program discounts, you would have only sold [100 - (% FROM ABOVE QUESTION * 100)] [MEASURE NAME] that week without the program discounts?
Importance of Program Rebates to Customer Purchase Decision
During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the [MEASURE NAME]? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

3.4.2 Free-ridership and Spillover Estimation Methodology

For each measure, NMR evaluated the responses to these questions separately, on a case-by-case basis for each individual respondent to the retailer survey. Overall, NMR sought to develop the free-ridership estimates in three steps. NMR first estimated the percentage of sales that would have occurred without the program, from which we then calculated unweighted free-ridership. The unweighted estimate of free-ridership was weighted by the percentage of total program sales for each retail chain or independent retailer as reported by the implementation contractor.

Estimated Sales without Program

In general, NMR estimated the percent of sales without the program by first calculating the share of additional program period sales that each retailer attributed to the program. NMR then added the attributed share of program period sales and the share of rebated measure sales that the retailers reported in the pre-program period. The latter assumes that, without the program, sales would have continued in the same proportions as in the months preceding the program. These calculations are described mathematically as follows:

$$Y = ((X_t - X_{t-1}) * (1 - Z_{t-1})) + X_{t-1}$$

Where:

Y = Percent of sales that would have happened without the program

X_t = Sales of rebated measure as percent of measure category sales during the program period of October – November 2010

X_{t-1} = Sales of rebated measure as percent of measure category sales in the pre-program period of January–September 2010

Z_{t-1} = Percent of higher sales in X_t relative to X_{t-1} attributed to program

Free-ridership

These estimated sales represented the absolute percentage of percentage of sales that would have occurred without the program. They did not, however, take into account the percentage of sales that occurred during the program period. Therefore, percentage free-ridership was calculated as a ratio of the absolute percentage of percentage of sales that would have occurred without the program to the absolute percentage of sales that occurred during the program period. An example of a complete calculation is provided in Table 3-10:

Table 3-10: Free-ridership Estimation Example

ES Light Fixtures as Percent of All Fixture Sales		Percent of Higher Sales Attributed to Program relative to Jan-Sep 2010	Percent of Sales without Program	Free-ridership
Jan-Sep 2010	Oct-Nov 2010			
50%	75%	90%	52.5%	70%

In the above example, the retail store manager attributed the following as the percentage of additional sales due to the program: $90\% * (75\% - 50\%) = 90\% * 25\% = 22.5\%$.

The percent of additional sales that would have occurred without the program therefore is: $25\% - 22.5\% = 2.5\%$.

And the percent of total sales that would have occurred without the program is: $50\% + 2.5\% = 52.5\%$.

The unweighted free-ridership percentage then is: $52.5\% \div 75\% = 70\%$.

Spillover

Only two respondents provided estimates of higher sales for outdoor timers after the program in December 2010 which they attributed at least partially to the continuing effect of the program. For these respondents, we used a similar approach to estimate the differential impact of these sales and subtracted them from the above estimated sales without the program. Thus we sought to estimate the continuing spillover impact of the sales of outdoor timers as follows:

$$\hat{Y} = (X_{t+1} - X_{t-1}) * \hat{Z}_{t-1}$$

Where:

$\hat{Y}$ = Percent of sales in the post-program month that occurred as a result of the spillover impact of the program

X_{t+1} = Sales of rebated measure as percent of measure category sales during the post-program period of December 2010

X_{t-1} = Sales of rebated measure as percent of measure category sales in the pre-program period of January–September 2010

$\hat{Z}_{t-1}$ = Percent of higher sales in X_{t+1} relative to X_{t-1} attributed to program spillover impact

The resulting absolute spillover percentage was subtracted from the estimated sales without the program.

Case-by-Case Estimation

Note, however, that not all retailers provided complete or consistent answers to every question and, in these cases, we evaluated the question-by-question responses for each individual respondent to estimate free-ridership. In these cases, we then looked at their responses to the other questions shown in Table 3-9 to calculate free-ridership. A not infrequent scenario was one where the retailers estimated that sales in absence would have been the same and/or that they reported the exact same percentages for sales during the program period and the pre-program period. Since these retailers were reporting that all of their customers would have bought the rebated measures anyway, free-ridership was estimated to be 100%.

Table 3-11: Free-ridership: ENERGY STAR Light Fixtures

	ES Light Fixtures as Percent of All Fixture Sales				Percent of Higher Sales Attributed to Program relative to:		Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership	Weighted Free-ridership
	Jan-Sep 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009	Jan-Sep 2010	Oct-Nov 2009	Volume	Percent Lower				
1	50%	75%	10%	50%	90%	75%	na	na	5	53%	70%	24%
2	3%	5%	1%	5%	75%	0%	lower	3%	5	4%	70%	1%
3	na	25%	10%	na	20%	0%	lower	na	5	22%	88%	1%
4	1%	2%	0%	0%	100%	0%	lower	100%	5	1%	50%	1%
5	30%	50%	30%	40%	50%	0%	same	na	4	40%	80%	1%
6	5%	15%	5%	na	100%	0%	lower	50%	5	5%	33%	10%
7	20%	70%	20%	50%	40%	40%	lower	40%	5	50%	71%	21%
Overall Program										25%	66%	60%

Table 3-12: Free-ridership: Power Bars with Timers

	Rebated Power Bars with Timers as Percent of All Power Bars with Timers				Percent of Higher Sales Attributed to Program relative to:		Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership	Weighted Free-ridership
	Jan-Sep 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009	Jan-Sep 2010	Oct-Nov 2009	Volume	Percent Lower				
1	100%	100%	100%	100%	na	na	lower	100%	5	100%	100%	2%
2	1%	20%	10%	0%	na	na	lower	100%	5	1%	5%	0%
3	40%	65%	35%	na	60%	na	same	na	5	50%	77%	16%
4	40%	60%	na	na	90%	na	same	na	5	42%	70%	14%
5	50%	50%	na	25%	na	na	lower	50%	4	50%	100%	19%
6	50%	75%	50%	50%	100%	na	lower	80%	4	50%	67%	1%
7	20%	30%	20%	20%	30%	20%	lower	30%	5	27%	90%	2%
8	2%	20%	20%	0%	80%	80%	higher	na	5	6%	28%	0%
9	50%	50%	0%	0%	50%	100%	lower	75%	4	50%	100%	2%
10	0%	100%	0%	na	na	na	same	na	4	0%	0%	0%
11	75%	100%	75%	na	100%	na	same	na	5	75%	75%	15%
12	15%	40%	15%	15%	50%	na	lower	30%	5	28%	69%	6%
Overall Program										40%	65%	76%

Table 3-13: Free-ridership: Indoor Light Timers

	Rebated Indoor Light Timers as Percent of All Indoor Light Timers				Percent of Higher Sales Attributed to Program relative to:		Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership	Weighted Free-ridership
	Jan-Sep 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009	Jan-Sep 2010	Oct-Nov 2009	Volume	Percent Lower				
1	2%	2%	2%	2%	na	na	same	na	5	2%	100%	14%
2	75%	100%	100%	100%	80%	na	lower	40%	3	80%	80%	0%
3	1%	1%	0%	0%	na	na	same	na	1	1%	100%	14%
4	0%	100%	0%	0%	100%	na	lower	100%	5	0%	0%	0%
5	30%	30%	50%	30%	na	na	lower	50%	4	20%	67%	9%
6	40%	50%	40%	20%	100%	na	lower	70%	4	40%	80%	0%
7	30%	100%	0%	na	na	na	same	na	5	100%	100%	14%
8	20%	20%	10%	10%	50%	50%	lower	30%	5	20%	100%	1%
9	33%	40%	10%	50%	40%	na	same	na	3	37%	93%	1%
10	50%	30%	20%	60%	na	na	same	na	2	30%	100%	1%
11	10%	20%	0%	na	10%	na	same	na	5	19%	95%	1%
12	20%	50%	10%	20%	60%	na	lower	50%	4	32%	64%	9%
13	na	90%	90%	na	na	na	lower	60%	4	56%	63%	9%
14	na	20%	na	na	na	na	same	na	1	20%	100%	14%
Overall Program										33%	82%	84%

Table 3-14: Free-ridership: Heavy Duty Pool/Outdoor Timers

	Rebated Heavy Duty Pool/Outdoor Timers as Percent of All Heavy Duty Pool/Outdoor Timers				Percent of Higher Sales Attributed to Program relative to:			Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership (Includes Spillover)	Weighted Free-ridership (Includes Spillover)
	Jan-Sep 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009	Jan-Sep 2010	Oct-Nov 2009	Dec 2010	Volume	Percent Lower				
1	10%	20%	10%	10%	100%	100%	na	lower	10%	5	10%	50%	11%
2	0%	100%	100%	0%	100%	na	na	lower	100%	5	0%	0%	0%
3	0%	100%	0%	na	100%	na	na	lower	100%	5	0%	0%	0%
4	40%	40%	30%	40%	na	na	na	lower	20%	3	40%	100%	22%
5	60%	90%	90%	50%	90%	na	100%	lower	30%	5	33%	37%	5%
6	20%	60%	20%	60%	50%	na	na	lower	15%	5	40%	67%	17%
7	5%	15%	5%	5%	20%	20%	na	same	na	1	13%	87%	0%
8	100%	100%	100%	100%	na	na	na	same	na	3	100%	100%	0%
9	10%	20%	0%	na	10%	na	na	same	na	5	19%	95%	0%
10	30%	60%	50%	99%	65%	na	70%	lower	40%	5	27%	44%	4%
11	100%	100%	100%	100%	na	na	na	same	na	5	100%	100%	9%
Overall Program											35%	62%	67%

The following tables show the final overall unweighted and weighted free-ridership for each measure.

Table 3-15: Free-Ridership by Measure—Fixtures and Controls

Measure	Free-ridership	
	Unweighted	Weighted
ES indoor light fixtures	66%	60%
Programmable thermostats	0%	0%
Indoor light timers	82%	84%
Outdoor/heavy duty timers	62%	67%
Dimmer switches	0%	0%
Power bars with timers	65%	76%

*Free-ridership takes into account the effects of spillover for heavy duty pool or outdoor timers

3.5 Net Impacts—Fixtures and Controls

Table 3-16 presents the net installed annual energy and demand savings for the F&C components of the PD program in 2010. For the 2010 program year, the generator-level impacts are estimated at 1,071 MWh of energy savings and 225.7 kW of demand savings.

Table 3-16: Fixture and Controls Energy Savings Estimates

	Gross Savings at Generator		Net-to-Gross Ratio (%)	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
ES indoor light fixtures	70.1	307	40%	28.0	123
Programmable thermostats	108.8	522	100%	108.8	522
Indoor light timers	26.7	128	16%	4.3	20
Outdoor/heavy duty timers	191.3	918	33%	63.1	303
Dimmer switches	20.8	100	100%	20.8	100
Power bars with timers	2.7	13	24%	0.6	3
Total	420.4	1,988	54%	225.7	1,071

4 Impact Evaluation: Appliance Rebates

The Power Down program (PD) Appliance Rebate (APP) component ran from October 1st, 2010 through the end of December 2010. The program provided rebates at the retail level for ENERGY STAR refrigerators and clothes washers.

The NMR team used evaluation databases such as the California Measurement Advisory Council (CALMAC) and Consortium for Energy Efficiency (CEE) databases to identify previous research conducted on these measures.^{[28][29]} Using databases such as these, we reviewed a variety of secondary sources to assess the validity of the program's current savings assumptions for all of these measures. This section presents a review of these studies and the adjusted program savings for the APP component of the PD program based on our evaluation.

After reviewing the program's tracking database, it appears that the program's savings estimates are all based on the Ontario Power Authority report titled "2010 Prescriptive Measures and Assumptions."³⁰ This is reasonable as the OPA report offers savings estimates for each of the products rebated through the PD program.

4.1.1 ENERGY STAR Refrigerators

According to the program's tracking database there were 2,191 full sized ENERGY STAR qualified refrigerators rebated through the program, resulting in savings of 247,145 kWh. The program's current savings estimate of 112.8 kWh per refrigerator is based on the OPA report. NMR reviewed a number of sources to determine whether or not the program's current savings estimate is reasonable. The following studies and data were reviewed:³¹

- Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.
- Mowris and Carlson (2005). *Measurement & Verification Load Impact Study for NCPA SB5X Miscellaneous Rebate Programs*. June 25, 2005.
- Blasnik (2004). *Measurement & Verification of Residential Refrigerator Energy Use*. June 29, 2004.³²
- NMR Group, Inc. (2010). *Impact and Process Evaluation: Low Income Households Program 2009*. February 25, 2010.³³
- Cadmus (2010). *Residential Retrofit High Impact Measure Evaluation Report*. February 8, 2010.³⁴
- AHAM (2010). *Trends in Energy efficiency 2009*. July 6th, 2010.

²⁸ <http://www.calmac.org/search.asp>

²⁹ <http://www.cee1.org/search/search.php>

³⁰ Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.

³¹ We also reviewed the EnerGuide and ENERGY STAR websites.

³² This study was sponsored by the Massachusetts electric utilities.

³³ This study was sponsored by Nova Scotia Power.

³⁴ This study was prepared for the California Public Utilities Commission (CPUC) and sponsored by California's Investor-Owned Utilities (IOUs).

Of the reports that we reviewed, only the OPA and Mowris & Carlson reports specifically identified savings from ENERGY STAR qualified refrigerators. Both reports had a similar approach to estimating the savings from ENERGY STAR qualified refrigerators. Each report analyzed a sample of ENERGY STAR qualified and non-ENERGY STAR refrigerators, compared the consumption, and subsequently estimated savings. Mowris & Carlson used the ENERGY STAR database that compares ENERGY STAR qualified refrigerators to the National Appliance Energy Conservation Act (NAECA) standards.³⁵ It is not clear which database the OPA used, but the report mentions the results are a weighted average based on size and configuration. Ultimately we chose to continue to use the OPA estimate as our research did not justify a change in the current savings estimate. Based on our review of other studies the OPA's estimated consumption for both ENERGY STAR qualified and non-ENERGY STAR refrigerators seem reasonable.³⁶ As previously mentioned, the program provided rebates for 2,191 full sized ENERGY STAR qualified refrigerators, resulting in savings of 247,145 kWh. (Table 4-1)

Table 4-1: Tracked and Evaluated Savings—ENERGY STAR Qualified Refrigerators

	Tracked and Evaluated
Number of units	2,191
Savings per unit (kWh)	112.8
Total savings (kWh)	247,145

4.1.2 ENERGY STAR Clothes Washers

The PD program currently assumes that ENERGY STAR qualified clothes washers have savings of 181.27 kWh per year. The program's current assumptions are based on the OPA report, which are based on federal and ENERGY STAR energy factor standards. The NMR team reviewed three reports to determine whether or not the current program assumption is reasonable. The following reports and data were reviewed:

- Cadmus (2010). *Residential Retrofit High Impact Measure Evaluation Report*. February 8, 2010.³⁷
- NMR (2007). *Estimates of Net Impact of the 2006 Massachusetts ENERGY STAR Appliances Program, Clothes Washer component*. July 2, 2007.
- Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.
- AHAM (2010). *Trends in Energy efficiency 2009*. July 6th, 2010.

NMR ultimately used data from the Cadmus report to develop savings estimates for ENERGY STAR clothes washers. This report looked at the combined savings from electric water heaters, electric dryers,

³⁵ http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=RF

³⁶ The OPA estimates consumption at 451.21 kWh per year for ENERGY STAR qualified refrigerators and 564.01 kWh per year for non-ENERGY STAR refrigerators.

³⁷ This study was prepared for the California Public Utilities Commission (CPUC) and sponsored by California's Investor-Owned Utilities (IOUs).

and electric washing machines to determine the savings from ENERGY STAR clothes washers. The Cadmus report justified the decision to include dryer and water heater savings with the following reasons:

- 1) ENERGY STAR washing machines use less water, requiring less heated water for each cycle.
- 2) Higher spin cycle speeds in ENERGY STAR washing machines mean less moisture in the clothes and less energy needed for drying.

Savings were estimated to be 0.8 kWh per cycle from ENERGY STAR qualified washing machines. This value includes the savings from all three appliances associated with washing loads (water heaters, washing machines, and dryers). Assuming an average of 5.82 cycles per week and 52 weeks per year, the savings estimate of 0.8 kWh per cycle results in annual savings of 242 kWh per unit. The program rebated 2,025 ENERGY STAR qualified clothes washers resulting in savings of 490,050 kWh—a 34% increase relative to the program's current estimates. (Table 4-2)

Table 4-2: Tracked and Evaluated Savings—ENERGY STAR Qualified Clothes Washers

	Tracked	Evaluated
Number of units	2,025	2,025
Savings per unit (kWh)	181.27	242
Total savings (kWh)	367,072	490,050

4.2 Gross Impacts—Appliances

Table 4-3 displays a comparison of the tracked and evaluated savings for ENERGY STAR refrigerators and clothes washers. NMR estimated total PD program savings for appliances to be 737 MWh at the meter and 825 MWh at the generator—a 20% increase compared to the tracking database estimates. Savings at the generator were calculated by applying a line loss factor of 1.1188.

Table 4-3: Detailed Comparison of Savings

	<i>N</i>	Tracked		Evaluated		
		Meter (MWh)	Generator (MWh)	Meter (MWh)	Generator (MWh)	Percent Change from Tracked
ES refrigerators	2,191	247	277	247	277	0%
ES clothes washers	2,025	367	411	490	548	34%
Total	4,216	614	688	737	825	20%

NMR calculated the demand savings for appliances and controls by obtaining the ratio of all residential target peak demand savings to target energy savings for the PD program. This ratio was taken from the adjusted 2010 DSM Targets³⁸. Based on an energy-to-demand ratio of 4.8, NMR calculated demand savings of 171.9 kW for appliances at the generator. (Table 4-4)

Table 4-4: Total Program Demand Savings

	Refrigerators	Clothes Washers
Gross savings at generator (MWh/year)	277	548
Energy-demand ratio	4.8	4.8
Ratio demand savings (kW)	57.7	114.2

4.3 Free-ridership

For each measure, NMR evaluated the responses to these questions separately on a case-by-case basis for each individual respondent to the retailer survey. Overall, NMR sought to develop the free-ridership estimates in three steps. NMR first estimated the percentage of sales that would have occurred without the program, from which we then calculated unweighted free-ridership. The unweighted estimate of free-ridership was weighted by the percentage of total program sales for each retail chain or independent retailer as reported by the implementation contractor.

Estimated Sales without Program

In general, NMR estimated the percent of sales without the program by first calculating the share of additional program period sales that each retailer attributed to the program. NMR then added the attributed share of program period sales and the share of rebated measure sales that the retailers reported in the pre-program period. The latter assumes that, without the program, sales would have continued in the same proportions as in the months preceding the program. These calculations are described mathematically as follows:

$$Y = ((X_t - X_{t-1}) * (1 - Z_{t-1})) + X_{t-1}$$

Where:

Y = Percent of sales that would have happened without the program

X_t = Sales of rebated measure as percent of measure category sales during the program period of October – November 2010

X_{t-1} = Sales of rebated measure as percent of measure category sales in the pre-program period of January–September 2010

Z_{t-1} = Percent of higher sales in X_t relative to X_{t-1} attributed to program

³⁸ Per Program Development Working Group January 26, 2010.

Free-ridership

These estimated sales represented the absolute percentage of percentage of sales that would have occurred without the program. They do not, however, take into account the percentage of sales that occurred during the program period. Therefore, percentage free-ridership was calculated as a ratio of the absolute percentage of percentage of sales that would have occurred without the program to the absolute percentage of sales that occurred during the program period. An example of a complete calculation is provided in Table 4-5:

Table 4-5: Free-ridership Estimation Example

ES Refrigerators as Percent of All Refrigerator Sales		Percent of Higher Sales Attributed to Program relative to Jan-Sep 2010	Percent of Sales without Program	Free-ridership
Jan-Sep 2010	Oct-Nov 2010			
50%	75%	90%	52.5%	70%

In the above example, the retail store manager attributed the following as the percentage of additional sales due to the program: $90\% * (75\% - 50\%) = 90\% * 25\% = 22.5\%$.

The percent of additional sales that would have occurred without the program therefore is: $25\% - 22.5\% = 2.5\%$.

And the percent of total sales that would have occurred without the program is: $50\% + 2.5\% = 52.5\%$.

The unweighted free-ridership percentage then is: $52.5\% \div 75\% = 70\%$.

Spillover

None of the respondents provided estimates of higher sales for refrigerators or clothes washers after the program in December 2010. Based on this, the resulting spillover percentage was 0%. Note, however, that the program campaign ended on December 31, 2010 and this evaluation was performed in January 2011. This did not allow much time for spillover effects to occur and be measured.

Case-by-Case Estimation

Note, however, that not all retailers provided complete or consistent answers to every question and, in these cases, we evaluated the question-by-question responses for each individual respondent to estimate free-ridership. In these cases, we then looked at their responses to the other questions shown in Table 3-9 to calculate free-ridership. A not infrequent scenario was one where the retailers estimated that sales in absence would have been the same and/or that they reported the exact same percentages for sales during the program period and the pre-program period. Since these retailers were reporting that all of their customers would have bought the rebated measures anyway, free-ridership was estimated to be 100%.

Table 4-6: Free-ridership: Refrigerators

	Rebated Refrigerators as Percent of All Refrigerators				Percent of Higher Sales Attributed to Program relative to:		Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership	Weighted Free-ridership
	Jan-Sep 2010	Oct-Dec 2010	Jan 2011	Oct-Dec 2009	Jan-Sep 2010	Oct-Dec 2009	Volume	Percent Lower				
1	10%	15%	na	10%	50%	50%	lower	na	3	13%	83%	0%
2	30%	70%	na	na	100%	na	lower	50%	5	30%	43%	0%
3	100%	100%	na	100%	na	na	same	na	2	100%	100%	2%
4	90%	100%	na	80%	50%	50%	same	na	2	95%	95%	1%
5	na	75%	50%	na	na	na	lower	25%	3	60%	80%	5%
6	90%	90%	90%	90%	na	na	same	na	4	100%	100%	21%
7	30%	40%	50%	20%	50%	na	lower	30%	4	35%	88%	18%
8	2%	75%	20%	5%	95%	na	lower	50%	5	6%	8%	2%
9	60%	70%	70%	na	100%	na	lower	10%	5	60%	86%	18%
10	80%	90%	80%	na	100%	na	lower	10%	4	80%	89%	6%
Overall Program										58%	77%	72%

Table 4-7: Free-ridership: Clothes Washers

	Rebated Clothes Washers as Percent of All Clothes Washers				Percent of Higher Sales Attributed to Program relative to:		Estimated Sales in Absence of Program		Importance of Rebate to Customer Purchase Decision	Percent of Sales without Program	Free-ridership	Weighted Free-ridership
	Jan-Sep 2010	Oct-Dec 2010	Jan 2011	Oct-Dec 2009	Jan-Sep 2010	Oct-Dec 2009	Volume	Percent Lower				
1	40%	40%	na	40%	na	na	same	na	4	40%	100%	0%
2	50%	75%	na	na	100%	na	lower	25%	5	50%	67%	1%
3	90%	90%	na	na	na	na	same	na	2	90%	100%	5%
4	60%	95%	na	70%	na	na	lower	20%	4	79%	83%	2%
5	na	75%	50%	na	na	na	lower	19%	4	63%	84%	9%
6	90%	90%	90%	90%	na	na	lower	10%	4	90%	100%	20%
7	50%	50%	50%	50%	na	na	same	na	3	50%	100%	20%
8	20%	50%	10%	25%	100%	na	lower	50%	5	20%	40%	8%
9	50%	50%	50%	50%	na	na	same	na	2	50%	100%	20%
Overall Program										59%	86%	85%

The following tables show the final overall unweighted and weighted free-ridership for each measure.

Table 4-8: Free-Ridership by Measure—Appliances

	Refrigerators	Clothes Washers
Unweighted free-ridership	77%	86%
Weighted free-ridership	72%	85%

4.4 Net Impacts—Appliances

Table 4-9 presents the net installed annual energy and demand savings for the APP component of the PD program in 2010. For the 2010 program year, the generator-level impacts were estimated at 160 MWh of energy savings and 31.5 kW of demand savings.

Table 4-9: Appliance Energy Savings Estimates

	Gross Savings at Generator		Net-to-Gross Ratio (%)	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
Refrigerators	57.7	277	28%	16.2	78
Clothes Washers	114.2	548	15%	17.1	82
Total	171.9	825	19%	33.3	160

5 Process Evaluation: CFLs

5.1 Methodology

The 2010 process evaluation relied on several different data streams, including interviews with program staff and implementation contractors and surveys of residential customers; the results of the residential survey were also used in the impact evaluation.

5.1.1 In-depth Interviews

NMR staff conducted one interview in July with the PD program manager and one interview in December with the implementation contractor's project manager. The interviews covered a variety of program-related topics, including program goals, program theory and delivery.

5.1.2 Residential Survey

Seventy program participants and 70 non-participants were identified through telephone screening based on self-reported CFL purchases during the active program period. Based on the telephone screening of the random digit dial (RDD) sample of Nova Scotia residents, NMR determined the incidence of program participants to be 31%—notably higher than in 2008 and 2009 (11% and 17%, respectively). This by itself indicates that the CFL component of the PD program has built momentum and has moved Nova Scotia residents higher on the product diffusion curve. Throughout this section of the report, the participant and non-participant responses have been combined when appropriate, weighted by the actual incidence of participants in the population.

The following criteria were used to identify likely program participants:

- They reported being familiar with CFL bulbs after being read a description of the bulbs.
- They reported purchasing CFLs from one of eleven participating stores during the program period between October 1st and November 30th.
- They reported purchasing at least one ENERGY STAR-qualified CFL.

The telephone survey was used to estimate spillover, in-service rates for recent CFL purchases and net participant sales, which incorporate the effects of free-ridership and spillover.

The survey was conducted by NMR's subcontractor, Interviewing Services of America, out of its offices in Halifax, NS. The interviews were conducted in December 2010 utilizing computer-assisted telephone interviewing (CATI) and a random digit dial (RDD) sample of residential telephone numbers in Nova Scotia.

5.1.3 Sampling Error

Table 5-1 shows the estimated population of households, sample size and associated sampling error at the 90% confidence level for the telephone surveys.

Table 5-1: Sample Size and Sampling Error

	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
Participant survey	116,822	70	±9.8%
Non-participant survey	260,023	70	±9.8%
Overall residential survey	376,845	140	±6.9%

5.2 Program Goals and Design

The lighting component of the PD program was designed to achieve energy savings of 2,330.27 MWh through sales of CFLs and light fixtures at participating retailers throughout Nova Scotia.

The 2010 Power Down program was the third year that the DSM Administrator offered a retail-based CFL incentive program. The general goals and design are outlined in the 2010 program contract with the implementation contractor. The 2010 program shifted its focus from promotions of multi-packs and specialty CFLs and notable program changes included the removal of restrictions for qualification based on pack size and bulb type. In addition, the program did not operate any in-store events or give-away promotions during the 2010 program year. The program used markdown at ten retail locations and utilized coupons at one retail location. This is in contrast to the 2009 program which used coupons at five retail locations. At one retailer, coupons were provided to cashiers and signage in the stores was adjusted to inform customers to ask at the cash register for their discounts. Whether or not the customers requested it, the cashier gave the discounts; the cashiers were trained to tear off and apply the coupon every time they rang up a qualifying CFL. Notably, this retailer accounted for 35% of participating stores and only 2% of all program CFL sales.

5.3 Program Responsibility and Communication

In the in-depth interviews, the DSM Administrator and the implementation contractor staff said they were satisfied with the current level of communication.

Per its contract, the implementation contractor was responsible for the following program development, implementation and tracking activities:

Program Development

- Developing a detailed project plan
- Evaluating the availability of products for the program
- Determining the products to be specified for the program
- Developing the marketing plan

Program Implementation

- Executing the marketing plan
- Visiting or calling 200 home improvement retailers
- Disseminating in-store materials
- Training staff and associates

Program Tracking

- Tracking program sales
- Estimating free-ridership
- Estimating energy savings achieved

5.4 Outreach and Marketing

In the in-depth interviews, the program manager and program implementation staff reported that as in 2009, the 2010 program was more effective in its dealings with retailers than in 2008. Retailers included the DSM Administrator and the PD program in their promotions and signage. In addition, one staff member said that retailers had become more familiar with the rebate programs over time. This may be a contributing factor to the increased sales in 2010.

Based on opportunities identified by the program manager and program implementation staff in 2009, for the 2010 program, marketing activities were initiated much earlier than kickoff and included:

- Direct mail sent to all residential addresses in Nova Scotia
- Radio and newspaper advertisement
- Inclusion of rebates and featured products in retailer flyers
- In-store signage
- Customer engagement events at selected retailers

5.5 Rebate Processing and Verification

In the in-depth interview, the implementation contractor's program manager described the overall procedures for applying the rebates to product purchases and for processing and verifying the rebates.

5.5.1 Applying the Rebates

Most of the chain retailers and all of the independent retailers rang up the rebate to customers automatically at the cash register at the time of purchase of a qualifying product. As noted earlier, one of the retailers used coupons as they did not have a centralized point-of-sale system. For this retailer, there were a wide array of coupons specific to the product categories and rebate amounts; this was done to avoid cashiers having to look up a reference list to confirm if a product was approved for a rebate.

5.5.2 Rebate Processing and Verification

The rebate processing and verification procedures accordingly varied by type of retailer and method of application of rebate.

- Chain retailers
 - Retailers submitted summary of sales data (reconciled for returns/recalls) – this sales data was generated by retailer’s centralized sales systems.
 - The implementation contractor reviewed the data and ensured that products were from approved SKU list (in retailer contracts) and the rebated amounts were correct.
 - Discrepancies or inaccuracies were discussed with retailers and the implementation contractor requested corrected sales summaries together with an invoice for the approved total rebate amount.
 - The retailers were reimbursed for rebate amount.
- Independent Retailers
 - Retailers submitted a summary sheet of sales together with copies of receipts for all rebate transactions.
 - Receipts had to clearly indicate date, product description and rebate amount.
 - Summary sheets are reviewed against physical receipts to ensure product qualification and accurate rebate amounts.
 - Corrections to store claims were made as per above review.
 - 10 independent retailers (30%) underwent a thorough audit to review their sales data, invoices, orders for inventory and products related to rebate transactions and, where possible, contacted customers directly to confirm purchase and rebate.
 - After review and approval, retailers were asked to submit an invoice to the implementation contractor.
 - Payments were made directly to retailers.
- One specific retailer
 - Retailers/Dealers submitted summary of sales together with coupons and copies of receipts to the implementation contractor.
 - All receipts had to clearly indicate date of purchase, product details and rebate amount.
 - Coupons/receipts were reviewed against summary sheets to ensure accurate quantities and rebated amounts as well as product qualification.
 - Corrections to dealer/store claims were made where necessary.
 - Reviewed data (corrected where necessary) was shared with the retailer’s head office for preparation of invoice.
 - Payment was made to the head office, who then distributed reimbursements to dealers.

The implementation contractor's program manager added that, although rebate processing and verification for this retailer was onerous, including this chain of stores was key for the program to have a broad enough customer reach.

5.6 NMR On-Site Visits

NMR conducted on-site visits to two retail store locations.

At the first location, the NMR representative reviewed the shelves where lighting and controls products were located. Both the lighting and controls shelves had "Power Down" shelf talkers/tags prominently displayed. However, it was difficult to tell which specific items were discounted, especially for dimmer switches. For CFLs, all ENERGY STAR CFLs were discounted but even for these, the label did not tell customers to look for the ENERGY STAR logo. In a subsequent discussion with program manager, NMR was told that each retailer had adapted the product tags and signage to their specific practices; as a result, the program was not able to establish consistency in program signage and advertising.

At the second location, an in-store event was in progress at the time of the visit. The NMR representative noted the staffed "Power Down" promotion table inside store, prominently located in front of one of the main entry doors. The Power Down staff person explained the discount and personally led the NMR representative to each of the aisles where the discounted items were stocked. However, there were no shelf talkers/display tags for the products on the shelves—it seems that these shelf talkers/display tags had been used by Power Down staff person at the promotion table because they had not received additional such signage for in-store event. The Power Down staff person also informed the NMR representative that CFLs and outdoor timers were particularly popular. She added, however, that the rebate for the product will not ring up at the cash register because of a glitch in the cash register programming and that the cashier would need to be told about the rebate at the time of purchase. The NMR representative tested this by trying to purchase an outdoor timer and the discount did not automatically ring up. When told about the discount, the cashier did not know anything about it and did not know how to ring it up; she needed to get the help of another cashier to ring up the discount on the item.

5.7 Awareness of ENERGY STAR

For the 2010 survey, NMR added a series of questions to gauge respondents level of familiarity with the ENERGY STAR™ label and products. About four out of five 2010 participants (79%) said they were somewhat or very familiar with the ENERGY STAR™ label or symbol – significantly more than non-participants (64%) (Table 5-2). Despite participants' higher stated level of familiarity, when asked to identify if ENERGY STAR™ labeled a variety of products, about the same percentage of participants and non-participants correctly said that they could purchase ENERGY STAR™-qualified models for four out of five of the products. For the fifth product (heat pumps), significantly fewer participants (25%) said that they could purchase ENERGY STAR™-qualified models compared to non-participants (40%) (Table 5-3). Finally, respondents were asked to describe, in their own words, what they knew about the ENERGY STAR™ label or symbol. As Table 5-4 shows, about three out of five participants (59%) and non-participants (62%) said that the label represented energy efficiency.

Table 5-2: Level of Familiarity with ENERGY STAR™^{[39][40]}

	2010 Participants	2010 Non- Participants	2010 Total (Weighted)⁴¹
<i>Sample size</i>	70	70	140
Very familiar	36%	20% ^Ω	24%
Somewhat familiar	43	44	43
Slightly familiar	6	7	6
Not at all familiar before description	16	27	26
Don't know	--	1	1

Table 5-3: ENERGY STAR™ Products Available - 2010

	Participants	Non- Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
CFLs	88%	78%	76%
Light Fixtures	73%	64%	64%
Refrigerators	92%	94%	91%
Clothes Washers	90%	94%	90%
Heat Pumps	25%	40% ^Ω	32%

Table 5-4: Knowledge of ENERGY STAR™ Label - 2010
(multiple response)

	Participants	Non- Participants	Total (Weighted)
<i>Sample size</i>	59	50	109
Energy efficient	59%	62%	62%
Label on products	7%	12% ^Ω	10%
Rating system	12%	2%	8%
Show energy use per year	5%	6%	5%
Compares similar products	--	4%	2%
Better for environment	2%	2%	2%
Other	7%	2%	3%
Not much/nothing	14%	16%	14%

³⁹ Throughout this report, the symbol 'Ω' is used to indicate that results between participants and non-participants within the same year are significantly different at the 90% confidence level.

⁴⁰ Throughout this report, the symbol 'σ' is used to indicate that results between 2008 and 2009 are significantly different at the 90% confidence level; the symbol '†' is used to indicate that results between 2008 and 2010 participants are significantly different at the 90% confidence level; the symbol '6' is used to indicate that results between 2009 and 2010 participants are significantly different at the 90% confidence level.

⁴¹ Throughout this report, the participant and non-participant survey results have been combined based on the actual incidence of participants 2008 (11%), 2009 (17%), and 2010 (31%).

5.8 Program Awareness

In 2010, participants exhibited a high overall awareness of CFLs: nine out of ten (90%) were familiar with CFLs after being read a description and about six out of ten (63%) reported that they were “very familiar” with CFLs. In comparison, significantly fewer non-participants were familiar with CFLs (79%) and fewer than two out of five (39%) said they were “very familiar” with CFLs. Between 2007 and 2009, the DSM Administrator and Conserve Nova Scotia offered several CFL programs that distributed over 900,000 CFLs in the province.⁴² These programs are likely to have contributed to the high CFL-awareness levels among customers.

While the 2008 and 2009 respondents exhibited very similar overall levels of familiarity with CFLs, there were significantly fewer non-participants in 2010 (39%) than in 2008 (59%) and 2009 (62%) who were “very familiar” with CFLs (Table 5-5 and Table 5-6). This may be due in part to the increased incidence of program participants in 2010 (31%) than in 2009 (17%). With these higher levels of program participants, the non-participant group is likely to consist primarily of relative laggards in the adoption of CFLs.

Table 5-5: Level of Familiarity with CFLs - 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
Very familiar	63%	39% ^{Ω†6}	46% ⁶
Somewhat familiar	27	40 [†]	37
Slightly familiar	9 [†]	10 ⁶	8
Not at all familiar before description	1	9 ^Ω	7
Don't know	--	3	2

Table 5-6: Level of Familiarity with CFLs – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	60	70	130	70	71	141
Very familiar	68%	59%	59%	63%	62%	62%
Somewhat familiar	30	24	25	26	28	25
Slightly familiar	2	13 ^Ω	11	10	3 ^{Ωσ}	4
Not at all familiar before description	0	4 ^σ	4	1	7 ^σ	8
Don't know	--	--	--	0	1	1

⁴² <http://www.conservens.ca/lightingprograms>

In 2008 and 2009, one-third or fewer participants recalled seeing program promotions at stores where they purchased CFLs. In contrast, in 2010, three-quarters of participants (76%) recalled seeing the promotions at stores where they purchased CFLs. In addition, eight out of ten 2010 participants (81%) were aware that the DSM Administrator had offered a discount on the purchase of specific CFL bulbs at the stores. Non-participants in 2010 were similarly aware that the DSM Administrator had offered discounts on CFL packages at retail stores, with 69% reporting seeing the promotions at stores and 86% reporting awareness of the discounts. (Table 5-7)

In the in-depth interviews in 2008, program staff and the implementation contractor indicated that the 2008 program had started late and promotion for the program had not been included in the bill inserts distributed by the DSM Administrator—a mechanism, they suggested, that would have significantly increased customer awareness of the program. If customers had received and seen such a bill insert, it might have helped them make the connection to the in-store promotions. This was done in 2009 with no discernible impact on customer awareness of the program and in-store promotion. However, in 2010, in addition to bill inserts, the program was rolled together with other promotions for appliances and fixtures. The inclusion in a larger program seems to have increased the recall and awareness among both participants and non-participants.

Table 5-7: Participant and Non-Participant Program Awareness – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
Recall seeing promotion	76% ^{†6}	69% ^{†6}	74% ^{†6}
Aware of promotion	81% ^{†6}	86% ^{†6}	86% ^{†6}

Table 5-8: Participant and Non-Participant Program Awareness – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	60	68	128	70	64	134
Recall seeing promotion	25%	31%	29%	33%	31%	28%
Aware of promotion	10%	9%	9%	16%	14%	15%

5.9 CFL Purchase Motivations

5.9.1 Participants and Non-participants

When asked their reasons for purchasing CFLs during the program period, almost two out of three 2010 participants (63%) mentioned saving energy. The need to replace bulbs was the second-most frequently mentioned motivation (17%), followed by the desire for a long-life bulb (9%). Non-participants most frequently mentioned saving energy as their primary motivation (74%) as well. Non-participants mentioned having ‘wanted to try’ CFLs as the second-most frequently mentioned motivation (33%). Compared to 2008 and 2009, relatively few non-participants purchased CFLs during the program period (6 out of 70). (Table 5-9 and Table 5-10)

Table 5-9: Customers’ Reasons for Purchasing CFLs – 2010
(multiple response)

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	61	131
To save energy/electricity	63% [†]	74%	69%
To replace bulbs	17% ^{†‡}	5% ^{Ω†‡}	11% ^{†‡}
Wanted long-life bulb	9% ^{†‡}	10%	10%
To save money on bills	4% ^{†‡}	13% ^{Ω†‡}	10% ^{†‡}
Wanted to try	4% [‡]	10%	8%
Change in behavior	3%	3%	4% ^{†‡}
Low price	4%	3%	3%
Wanted/Needed - Unspecified	6% ^{†‡}	3%	3% [‡]
Good for environment	1% ^{†‡}	5% [‡]	3%
Like light they produce	0% [‡]	0%	0%
Utility recommended	0%	0%	0%
Needed specialty bulbs	0%	0%	0%
Heard they were safer	0%	0%	0%
Because of an ad	0%	0%	0% [†]
Recommended	0%	0%	0%
Fit better in fixtures	0%	0%	0%
Don't know	0%	0%	0% [†]

Table 5-10: Customers' Reasons for Purchasing CFLs – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	60	64	124	70	58	128
To save energy/electricity	82%	63%	65%	73%	71%	69%
To replace bulbs	3%	0%	1%	1%	0%	<1%
Wanted long-life bulb	23%	14%	15%	21%	14%	17%
To save money on bills	27%	25%	25%	40%	19% ^Σ	23%
Wanted to try	7%	9%	9%	19% ^Σ	10%	14%
Change in behavior	0%	0%	0%	0%	0%	0%
Low price	7%	3%	4%	7%	5%	5%
Wanted/Needed - Unspecified	0%	3%	3%	0%	0%	0%
Good for environment	17%	5%	7%	13%	9%	7%
Like light they produce	3%	2%	2%	4%	2%	2%
Utility recommended	2%	2%	2%	3%	0%	<1%
Needed specialty bulbs	2%	0%	0%	0%	0%	0%
Heard they were safer	0%	2%	2%	0%	0%	0%
Because of an ad	0%	0%	0%	0%	0%	0%
Because of ad	0%	3%	3%	0%	0%	0%
Recommended	0%	0%	0%	3%	0%	1%
Fit better in fixtures	0%	0%	0%	1%	0%	<1%
Don't know	0%	3%	3%	0%	3%	2%

5.10 CFL Purchase Barriers

Non-participants were asked the reason they had not purchased any qualifying CFLs during the program period. Nearly three out of four (73%) mentioned not needing CFLs as the primary reason – a significantly higher percentage than in 2008 (34%) and 2009 (53%). Waiting for bulbs to burn out (7%) was the second-most frequently mentioned reason (Table 5-11). These responses suggest that they might have been program participants had the program period been longer. Similar to 2008 and 2009, the majority of non-participants (80%) reported having at least one CFL currently installed in their homes, with an average of 13.9 CFLs installed in non-participating households. This further reinforces the likelihood that non-participants had not participated in the program by virtue of having no need to purchase CFLs during the program period as opposed to a resistance to purchasing CFLs. (Table 5-12)

Table 5-11: Non-Participant Barriers to Purchasing CFLs
(multiple response)

	2008	2009	2010
<i>Sample size</i>	64	51	60
Don't need them	34%	53% ^Σ	73% ^{†6}
Waiting for bulbs to burn out	23%	16%	7% ^{†6}
Too expensive	6%	8%	5%
Others in household purchase them	6%	6%	3%
Not bright enough	6%	0%	2%
They don't last long/break	0%	4%	2%
Bulbs give me headaches	0%	2%	2%
Does not fit properly	6%	2%	0% [†]
Not available in area/store	3%	0%	0%
Interference	3%	0%	0%
Paperwork is inconvenient	3%	0%	0%
Unaware of multipacks	3%	0%	0%
I'm just not that energy efficient	3%	0%	0%
Don't like the color	0%	2%	0%
Bulb contains mercury	0%	2%	0%
Renting	0%	2%	0%
Blind	0%	2%	0%
Don't know what they are	0%	2%	0%
I'm old, stick with what I have	0%	2%	0%
Paperwork is inconvenient	0%	2%	0%
Unaware of multipacks	0%	2%	0%
Not that interested in energy efficiency	0%	2%	0%
Don't know	9%	2% ^Σ	3%
Other	0%	0%	7% ^{†6}

Table 5-12: Non-Participant CFL Use and Installations

	2008	2009	2010
<i>Sample size</i>	68	68	65
Currently Use CFLs	85%	82%	80%
<i>Sample size</i>	57	55	65
Average # of CFLs Installed	11.1	13.3	13.9

5.11 CFL Purchase and Use Behaviors

5.11.1 Quantities of CFLs Purchased

Table 5-13 shows the estimated number of CFLs purchased by participants and non-participants during October and November 2010 (program period). During the program period, participants were more active buyers of CFLs than non-participants. Over the length of the entire program period (two months), participants (6.9) averaged nearly ten times as many purchases of CFLs as non-participants (0.7). About one-half of participants (55%) reported purchasing at least six CFLs. In contrast, only 5% of non-participants reported purchasing six or more CFLs during October and November. Significantly fewer 2010 participants (14%) than 2009 participants (27%) purchased eleven or more CFLs. Similarly, significantly more non-participants reported not purchasing any CFLs in 2010 (90%) than in 2008 (41%) or 2009 (73%).

Table 5-13: All CFL Purchases – Program Period – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	58	128
Average	6.9	0.7	2.7
Total	483	39	332
No purchases	0%	90% ^{Ω†6}	58%
1 to 5	44 ^{†6}	5 ^{Ω†}	24
6 to 10	41	3 ^{Ω†6}	14
11 to 15	7 [†]	2	3 [†]
16 or more	7 ^{†6}	0 ⁶	2 ⁶

Table 5-14: All CFL Purchases – Program Period – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	57	70	127	70	71	141
Average	13.2	3.3	4.4	10.4	2.4^Ω	3.8
Total	751	233	563	725	168	531
No purchases	0%	41%	36%	0%	73% ^{Ω σ}	55%
1 to 5	7	32	29	27 ^σ	14 ^{Ω σ}	20
6 to 10	40	16	19	46	6 ^{Ω σ}	16
11 to 15	26	8	10	9 ^σ	1 ^{Ω σ}	2
16 or more	26	3	6	19	6 ^Ω	7

Out of the 483 CFLs purchased by participants during the program period, 327 (67%) were qualifying CFL bulbs and were, therefore, counted as having been purchased through the program. Over the course of the program period, 2010 participants averaged significantly fewer purchases of qualifying CFLs (4.7) than 2008 participants (10.8), and about the same number of qualifying CFLs as 2009 participants (6.5). CFLs were determined to be qualifying bulbs if participants reported that they had been purchased from a participating retailer and were either a multipack containing six or more CFLs or any size purchase (including single bulbs) containing specialty CFLs. (Table 5-15)

Table 5-15: Qualifying CFL Purchases – Program Period Participants

	2008	2009	2010
<i>Sample size</i>	57	70	70
Program period average	10.8	6.5 ^σ	4.7 [†]
Monthly average	3.6	2.2	2.4
Total Qualifying CFLs	618	452	327

In the months prior to the program period, participant purchases (0.48) were almost the same as non-participant (0.51) purchases. In 2010 as a whole, participants (1.05) purchased more than twice as many CFLs on average as non-participants (0.58). As in 2008 and 2009, the change in purchase habits over the course of 2010 suggests that the program motivated increased customer purchases of CFLs. (Table 5-16, Table 5-17, Table 5-18, and Table 5-19)

Table 5-16: All CFL Purchases – Past Year – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	62	60	123
Average	12.6	7.0	8.3
Total	779	420	1019
No purchases	0%	25% ^Ω	18%
1 to 5	13	17	14 [†]
6 to 10	42 ^{†6}	32	40 ^{†6}
11 to 15	24	17	16
16 or more	21 ^{†6}	10 ^Ω	12 ^{†6}

Table 5-17: All CFL Purchases – Past Year – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	59	70	129	67	58	125
Average	17.3	8.9^σ	9.9	18.1	8.7	10.1
Total	1,019	624	1,259	1,212	504	1,263
No purchases	0%	20% ^σ	18%	0%	29% ^σ	23%
1 to 5	5	29 ^σ	26	9	17	13
6 to 10	22	24	24	24	22	28
11 to 15	30	10 ^σ	12	30	12 ^σ	17
16 or more	43	17 ^σ	20	37	19 ^σ	20

Table 5-18: All CFL Purchases – Outside the Program Period – 2010

	2010		
	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
Ten month average	4.8	5.1	4.9
Monthly average	0.48	0.51	0.49
Total	336	355	686

Table 5-19: All CFL Purchases – Outside the Program Period – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	59	70	129	70	71	141
Nine month average	4.1	5.6	5.5	7.0	4.7	5.2
Monthly average	0.46	0.62	.61	0.82	0.56	0.61
Total	268	391	696	487	336	732

5.11.2 In-Service Rate

Table 5-20 summarizes participant installations of CFLs purchased during the program period. We asked participants how many of the CFLs they had purchased during the program period were installed in their homes at the time of the interview. If all of the CFLs were not currently installed, we asked them to estimate the number of CFLs removed. Based on these answers and the number of CFLs they reported having purchased, we calculated the number of CFLs not yet installed. Four out of five CFLs (83%) purchased by participants during the program period were currently in-service, 17% had never been installed and less than one percent had been installed and later removed. In addition, participants planned to install slightly more than one-half of their uninstalled CFLs (55%) within the next year. 2010 participants had installed about the same proportion of CFLs as 2009 participants (81%) and significantly more CFLs compared to 2008 participants (68%).

Table 5-20: Installation of CFLs Purchased during the Program Period

Year		Installed	Removed	Storage	Plan to Install
2008	Average	9.0	0.2	4.1	1.1
	% of CFLs	68%	0.8%	31%	9%
2009	Average	8.8	0.1	4.3	1.6
	% of CFLs	81%	1%	18%	7%
2010	Average	5.8	0.1	1.1	3.4
	% of CFLs	83% [†]	0.4%	17% [†]	9%

When asked about the reasons for removing CFLs that had been installed, one participant reported that the bulbs had broken and the other participant said that the bulbs had not worked in a touch lamp. One of these participants subsequently threw the bulbs away, while the other had put them away in storage. (Table 3-14)

Table 5-21: CFLs Installed and Later Removed by Participants

Reason for Removal	2008	2009	2010
<i>Sample size</i>	5	6	2
Did not work in fixture	1	0	1
Bulb broke	0	1	1
Burned out	2	5	0
Bulb not bright enough	1	na	0
Did not fit properly in fixture	1	na	0
Put in another fixture	na	1	0
Disposition of Removed CFLs	2008	2009	2010
<i>Sample size</i>	5	6	2
Storage	3	0	1
Threw away	1	5	1
Returned to store	0	1	na
Don't remember	1	0	na

In all three program years, 2008 through 2010, the majority of participants reporting at least one CFL had not been installed indicated “bought as spares” as the primary reason for not installing those CFLs. However, significantly fewer 2010 participants (65%) reported this than 2009 participants (91%). Similar to 2008 and 2009, the large majority of participants (88%), reported that the CFLs that had not yet been installed were currently in storage. (Table 5-22)

Table 5-22: CFLs Not Yet Installed

Primary Reason for Not Installing CFLs	2008 Participants	2009 Participants	2010 Participants
<i>Sample size</i>	29	32	17
Bought as spares	69%	91% ^σ	65% ^δ
Only recently received the bulbs	7	3	12
Running out of places to put them	0	0	12
Not satisfied with light quality	0	0	6
Didn't fit in fixture for which they were intended	10	3	0 [†]
Haven't got around to it or forgot	7	3	6
Bought as gifts	3	0	0
Don't know	3	0	0
Secondary Reasons for Not Installing CFLs	2008 Participants	2009 Participants	2010 Participants
<i>Sample size</i>	29	32	17
Bought as spares	14%	0%	94% ^{†δ}
Running out of places to put them	0	0	6%
Haven't got around to it or forgot	0	3	0
Do not work with three-way switch or dimmer	4	3	0
Don't know	86	94	0
Disposition of CFLs Not Installed	2008 Participants	2009 Participants	2010 Participants
<i>Sample size</i>	29	32	17
Storage	93%	97%	88%
Threw away	0	0	6
Given away	3	0	0
Installed at some other place	0	3	0
Don't know	3	0	6

Table 5-23 summarizes the types of bulbs replaced by the recently-purchased CFLs and the rooms in which the CFLs were installed. Nearly four out of five CFLs (79%) replaced incandescent bulbs, 15% replaced existing CFLs, and 6% were installed in new fixtures. About one-fourth of the CFLs were installed in a living room or family room (22%), 21% were installed in kitchens, 14% were installed in bedrooms and 12% were installed in bathrooms. Participants reported using recently-purchased CFLs to replace bulbs with an overall average of 61 Watts, which was higher than reported in 2008 and 2009 (52 Watts and 56 Watts, respectively) although not significantly so. (Table 5-24)

Table 5-23: Disposition of Installed CFLs

Bulb Type Replaced	2008 Participants		2009 Participants		2010 Participants	
<i>Sample size</i>	55		69		68	
Incandescent bulb	80%		85%		79%	
CFL	9		6		15	
Installed in new fixture	11		8		6	
Room Where CFL Installed	2008 Participants	2008 Bulbs	2009 Participants	2009 Bulbs	2010 Participants	2010 Bulbs
<i>Sample size (n)</i>	58	512	69	583	68	68
Living room or family room	62%	24%	59%	22%	49%	22%
Kitchen	50%	17%	49%	17%	41%	21
Bedrooms	52%	15%	41%	16%	27%	14
Bathrooms	29%	7%	39%	12% ^Σ	27%	12
Basement	24%	8%	26%	11% ^Σ	15%	6
Hall or foyer	22%	3%	14%	3%	16%	6
Exterior/outside	31%	12%	22%	6% ^Σ	15%	6
Dining room	22%	4%	25%	7% ^Σ	7%	4
Utility room	5%	0%	3%	<1%	6%	2
Office	7%	2%	4%	1%	3%	0
Closet	9%	1%	1% ^Σ	0% ^Σ	3%	1
Recreation room	na	na	1%	<1%	2%	0
Garage	7%	1%	7%	2%	--	0
Den	3%	6%	1%	<1% ^Σ	--	0
Other	na	na	1%	1%	6%	6

Table 5-24: Average Wattage of Replaced Bulbs

Room	2008		2009		2010	
	Sample size	Wattage	Sample size	Wattage	Sample size	Wattage
Average for All Rooms	15	52	65	56	64	61
Living room or family room	10	56	36	61	29	60
Kitchen	9	56	29	56	27	64
Dining room	1	60	16	46	4	75
Bedrooms	6	49	26	53	17	60
Bathrooms	7	43	24	59	17	54
Office	0	0	3	44	2	80
Hall or foyer	3	60	10	55	8	64
Garage	1	60	5	61	0	0
Exterior/outside	3	67	10	68	6	66
Closet	1	2	0	0	2	80
Utility room	0	0	2	80	3	73
Basement	3	60	17	61	9	73
Den	0	0	1	60	0	0
Recreation room	0	0	1	60	1	60
Other	0	0	1	60	4	70

5.11.3 CFL Purchase Plans

Participants and non-participants were asked how likely they would be to purchase CFLs in the next year. Similar percentages of participants (52%) and non-participants (54%) reported they would be extremely likely to purchase CFLs in the next year. Likewise, similar percentages of participants (2%) and non-participants (7%) reported that they were extremely unlikely to purchase CFLs in the next year. In comparison to 2008 and 2009, a similar percentage of 2008 non-participants (56%) but significantly fewer 2009 non-participants (35%) reported that they would be “extremely likely” to purchase CFLs in the next year. (Table 5-25 and Table 5-26)

Table 5-25: Likelihood of Purchasing CFLs in the Next Year – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	68	59	127
10 'Extremely likely'	52%	54% ⁶	53% ⁶
9	6	5	5
8	25	7 ^Ω	13
7	0	9	6
6	4	10	8
5	12	5	8
4	0	0	0
3	0	3	3
2	0	0	0
1	0	0	0
0 'Extremely unlikely'	2	7	4

Table 5-26: Likelihood of Purchasing CFLs in the Next Year – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	57	66	123	65	65	130
10 'Extremely likely'	56%	56%	55%	55%	35% ^{σΣ}	40%
9	11	11	11	11	11	8
8	7	15	14	12	11	20
7	4	5	5	5	9	7
6	2	5	5	0	3	2
5	12	2	3	9	11 ^Σ	9
4	2	0	0	2	0	0
3	0	0	0	3	2	1
2	2	0	0	0	2	1
1	0	0	0	0	5 ^{σΣ}	3
0 'Extremely unlikely'	5	8	7	3	12 ^σ	8

Respondents who were unlikely to purchase CFLs in the next year (rated likelihood of five or less) were asked what would encourage them to purchase CFLs in the next year. In 2010, more rebates or promotions were the most frequently-mentioned motivations. (Table 5-27 and Table 5-28)

Table 5-27: Factors that Would Encourage CFL Purchases – 2010

	Participants	Non-Participants	Total – (Unweighted)
<i>Sample size</i>	9	9	18
More rebates/promotions	11%	22%	22%
If current CFLs burn out	22%	11%	18%
If they fit in fixtures better	0	22%	19%
Lower price	33%	0	8%
If they had better color	0	11%	7%
Make them brighter	0	11%	7%
Increased energy savings	11%	0	3%
If they lasted longer/didn't break	0	0	0
Have plenty in storage	0	0	0
If they worked with dimmer/3-way	0	0	0
If they didn't interfere with radio/TV/electronics	0	0	0
If I bought a new lamp	0	0	0
If they stopped making incandescents	0	0	0
If they didn't take so long to warm up	0	0	0
Give free sample	0	0	0
If I got a pay increase	0	0	0
If they had fewer health concerns	0	0	0
If I were educated about them	0	0	0
I like them	0	0	0
Don't know	33%	22%	21%

Table 5-28: Factors that Would Encourage CFL Purchases – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Unweighted)	Participants	Non-Participants	Total (Unweighted)
<i>Sample size</i>	12	6	18	12	22	34
More rebates/promotions	0%	0%	0%	0%	0%	0%
If current CFLs burn out	0	0	0	3	3	6
If they fit in fixtures better	0	0	0	0	1	1
Lower price	5	1	6	3	6	9
If they had better color	0	0	0	0	1	1
Make them brighter	3	2	5	1	2	3
Increased energy savings	1	3	4	1	0	1
If they lasted longer/didn't break	3	0	3	1	0	1
Have plenty in storage	2	0	2	1	0	1
If they worked with dimmer/3-way	1	0	1	0	0	0
If they didn't interfere with radio/TV/electronics	1	0	1	0	0	0
If I bought a new lamp	0	0	0	1	0	1
If they stopped making incandescents	0	0	0	0	1	1
If they didn't take so long to warm up	1	0	0	0	0	0
Give free sample	0	1	1	0	1	1
If I got a pay increase	0	1	1	0	0	0
If they had fewer health concerns	0	0	0	0	2	2
If I were educated about them	0	0	0	0	1	1
I like them	0	0	0	0	1	1
Don't know	1	0	1	1	3	4

5.12 Satisfaction

Both participants and non-participants exhibited high levels of satisfaction with the installed CFLs. More than nine out of ten participants and non-participants (95% and 91%, respectively) reported they were ‘satisfied’ or ‘very satisfied’ with the CFLs they had purchased or installed. In 2010, significantly fewer non-participants (37%) than in 2008 (66%) reported they were “very satisfied” with CFLs (Table 5-29 and Table 5-30). Two participants and three non-participants reported dissatisfaction with CFLs. One participant and two non-participants reported that the CFLs had burned out, one participant said they did not like the delay in the CFLs coming on, and one non-participant said they did not like the light (Table 3-21).

Table 5-29: Satisfaction with CFLs – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	65	52	117
Very satisfied	40% ⁶	37% [†]	37%
Satisfied	55	54 [†]	54 ⁶
Neither satisfied or dissatisfied	2	4	4
Dissatisfied	3	6	5
Not at all satisfied	0	0	0

Table 5-30: Satisfaction with CFLs – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	54	58	112	60	55	115
Very satisfied	52%	66%	64%	55%	45% ^σ	49%
Satisfied ⁷	44	29	31	42	36	34
Neither satisfied or dissatisfied	4	2	2	2	7	6
Dissatisfied	0	2	2	2	9	11
Not at all satisfied	0	2	2	0	2	1

Table 5-31: Reasons for Dissatisfaction with CFLs

	2010		
	Participants	Non-Participants	Total (Unweighted)
<i>Sample size</i>	2	3	5
Burned out	1	2	3
Delay in light coming on	1	0	1
Don't like the light	0	1	1

5.13 Demographics

As in 2008 and 2009, in general, participants and non-participants were similar in their demographic composition.⁴³ In 2010, both participants and non-participants were very likely to live in single family homes (83% and 86%, respectively) with three or more bedrooms (84% and 83%, respectively). However, compared to non-participants, participants were more likely to have higher incomes and own their homes.

In 2010, participants (96%) were significantly more likely than non-participants (83%) to own their homes. (Table 5-32)

Table 5-32: Home Ownership Status – 2010

	Participants	Non-Participants	Total (Weighted)	Census
<i>Sample size</i>	70	70	140	376,845
Own	96%	83% ⁴³	89%	72%
Rent	4	17	11	28

Table 5-33: Home Ownership Status – 2008 and 2009

	2008			2009			Census
	Participants	Non-Participants	Total	Participants	Non-Participants	Total	
<i>Sample size</i>	60	70	130	68	70	138	376,845
Own	93%	87%	88%	91%	93%	92%	72%
Rent	7	13	12	9	7	8	28

⁴³ Note here that the sample exhibits a few significant differences relative to the Census. NMR evaluated weighting the sample data to more closely match the Census data. However, owing to the relatively small survey sample sizes, this would have resulted in either weighting of segments with extremely small sample sizes and/or losing a number respondents because of refusals to questions on income or education. Neither of these were acceptable options and we, therefore, decided not to weight the data to the Census.

The majority of participants (83%) and non-participants (86%) lived in a single family detached home. (Table 5-34)

Table 5-34: Type of Residence – 2010

	Participants	Non-Participants	Total (Weighted)	Census
<i>Sample size</i>	70	70	140	376,845
Single family detached	83% ⁶	86% [†]	78% ⁶	67%
Semi-detached	7 ⁶	3	7	5
Townhouse or duplex	3	0 [†]	1 ^{†6}	3
Row house	1	0	<1	2
Apartment with fewer than five stories	1	6	9	15
Mobile home or house trailer	1	3	2	4
Apartment with more than five stories	0	1	2	4
Other	2	1	2	0

Table 5-35: Type of Residence – 2008 and 2009

	2008			2009			Census
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)	
<i>Sample size</i>	60	70	130	69	69	138	376,845
Single family detached	90%	70%	73%	93%	86% ^σ	69%	67%
Semi-detached	2	7	7	0	4 ^{σΩ}	7	5
Townhouse or duplex	5	10	9	1	3	10	3
Row house	0	3	3	0	0	0	2
Apartment with fewer than five stories	3	7	7	3	3	11	15
Mobile home or house trailer	0	3	3	1	4	3	4
Apartment with more than five stories	0	0	0	0	0	0	4
Tent home	0	0	0	1	0	<1	0

Among 2010 participants and non-participants, more than four out of five (84% for participants, 83% for non-participants) lived in a home with three or more bedrooms. (Table 5-36)

Table 5-36: Number of Bedrooms – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
1	3%	3%	4%
2	13	14	18
3	57	54	51
4 or more	27	29	27

Table 5-37: Number of Bedrooms – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	60	70	130	70	70	140
1	2%	4%	4%	3%	7%	13%
2	12	23	22	19	19	20
3	63	41	44	46 ^Σ	51	48
4 or more	23	31	2	32	23	19

2010 participants (59%) were more likely to have an annual income in excess of \$49,999 than non-participants (34%). The 2008, 2009, and 2010 respondents exhibit similar income distributions. (Table 5-38 and Table 5-39)

Table 5-38: Annual Income – 2010

	Participants	Non-Participants	Total (Weighted)	Census
<i>Sample size</i>	61	56	117	376,845
Less than \$15,000	5%	11%	9%	5%
\$15,000 to \$24,999	10	11	15	8
\$25,000 to \$34,999	7	18	17	12
\$35,000 to \$49,999	20	27	21	17
\$50,000 to \$69,999	21	9	14	20
\$70,000 to \$79,999	13	7	7	8
\$80,000 or more	25	18	16	29

Table 5-39: Annual Income – 2008 and 2009

	2008			2009			Census
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)	
<i>Sample size</i>	50	57	107	53	53	106	376,845
Less than \$15,000	4%	18%	16%	4%	8%	12%	5%
\$15,000 to \$24,999	8	18	17	9	11	19	8
\$25,000 to \$34,999	10	12	12	19	26 ^Σ	24	12
\$35,000 to \$49,999	24	21	22	17	17	13	17
\$50,000 to \$69,999	18	7	8	26	15	15	20
\$70,000 to \$79,999	12	9	9	2 ^Σ	2	1	8
\$80,000 or more	24	16	17	23	21	16	29

Just as in 2008 and 2009, practically all of the 2010 participants and non-participants lived in their homes year-round. (Table 5-40 and Table 5-41)

Table 5-40: Seasonal Home – 2010

	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	70	70	140
No	99%	94%	99%
Yes	1	6	1%

Table 5-41: Seasonal Home – 2008 and 2009

	2008			2009		
	Participants	Non-Participants	Total (Weighted)	Participants	Non-Participants	Total (Weighted)
<i>Sample size</i>	60	70	130	69	70	139
No	100%	99%	99%	97%	96%	97%
Yes	0	1	1	3	4	3

Both participants and non-participants reported an average of around 2.5 full-time residents in their households. (Table 5-42 and Table 5-43)

Table 5-42: Number of Full Time Residents – 2010

	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	69	69	138
1	15%	12%	13%
2	38	54 ^Ω	45
3	30 ^δ	19	26 ^{†6}
4	13	10	12
5 or more	4	5	5
Average	2.6	2.5	2.6

Table 5-43: Number of Full Time Residents – 2008 and 2009

	2008			2009		
	Participants	Non-participants	Total (Weighted)	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	60	70	130	67	69	136
1	15%	21%	20%	7%	13%	14%
2	43	44	43	51	57	51
3	22	16	16	15	10	14
4	13	11	11	18	16	13
5 or more	7	7	7	9	4	8
Average	2.5	2.5	2.5	2.7	2.4	2.6

As in 2008 and 2009, the large majority of participants (96%) and non-participants (94%) reported that they were responsible for paying their electric bills. (Table 5-45)

Table 5-44: Responsible for Electric Bill – 2010

	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	70	70	140
Yes	96%	94%	95%
No	4	6	5%

Table 5-45: Responsible for Electric Bill – 2008 and 2009

	2008			2009		
	Participants	Non-participants	Total (Weighted)	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	60	70	130	70	70	140
Yes	95%	89%	90%	94%	93%	82%
No	5	11	10	6	7	18

2010 participants and non-participants exhibited similar age distribution—the majority were 35 years old or older (81% and 88%, respectively). (Table 5-46)

Table 5-46: Respondent Age – 2010

	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	67	67	135
18 to 24	3%	3%	4%
25 to 34	15	9	16
35 to 44	22	15	20
45 to 54	19	22	18
55 to 64	21	27	21
65 or older	19	24	22

Table 5-47: Respondent Age – 2008 and 2009

	2008			2009		
	Participants	Non-participants	Total (Weighted)	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	60	70	130	67	69	136
18 to 24	8%	6%	6%	6%	0% ^{Ωσ}	1%
25 to 34	17	9	10	9	9	11
35 to 44	13	10	10	7	14	10
45 to 54	28	24	24	33	23	29
55 to 64	18	33	31	33 ^Σ	17 ^{Ωσ}	16
65 or older	15	19	18	12	36 ^{Ωσ}	32

2010 participants had significantly higher levels of education attainment compared to non-participants. About three-fifths of participants (61%) possessed a trade certificate, a college diploma, or a university diploma compared to two-fifths of non-participants (40%). (Table 5-48 and Table 5-49)

Table 5-48: Education Level – 2010

	Participants	Non-participants	Total (Weighted)	Census
<i>Sample size</i>	69	65	134	266,000
Less than high school	6%	17%	13%	27%
High school graduate	33	43	41	23
Trade certificate	6	8	7	12
College diploma	29	12	19	18
University diploma	26	20	21	16

Table 5-49: Education Level – 2008 and 2009

	2008			2009			Census
	Participants	Non-participants	Total (Weighted)	Participants	Non-participants	Total (Weighted)	
<i>Sample size</i>	53	68	121	66	67	133	266,000
Less than high school	9%	16%	15%	20% ^Σ	22%	18%	27%
High school graduate	42	42	41	32	36	44	23
Trade certificate	8	1	2	5	0 ^σ	1	12
College diploma	8	9	8	18 ^Σ	18	18	18
University diploma	45	31	31	26 ^Σ	24	20	16

The survey respondents were about equally split between males and females. (Table 5-50 and Table 5-51)

Table 5-50: Respondent Gender – 2010

	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	70	70	140
Female	61%	51%	56%
Male	39	49	44

Table 5-51: Respondent Gender – 2008 and 2009

	2008			2009		
	Participants	Non-participants	Total (Weighted)	Participants	Non-participants	Total (Weighted)
<i>Sample size</i>	60	70	130	70	71	141
Female	52%	56%	55%	57%	69%	69%
Male	48	44	44	43	31	31

6 Process Evaluation: Fixtures and Controls

6.1 Program Description

The Light Fixtures and Controls (F&C) portion of the 2010 Nova Scotia Power Down (PD) program began on October 1st 2010 and ran through the end of November 2010. The program was administered by the implementation contractor and was called the “Power Down Discount Program” in program literature and promotions. The Light Fixtures and Controls portion was designed to achieve annual energy savings of 1,163,744 kWh through the promotion of ENERGY STAR indoor light fixtures, programmable thermostats for electric baseboard heaters, indoor lighting timers, heavy duty outdoor or pool timers, power bars with integrated timers, and dimmer switches.

Rebated sales of light fixtures and controls greatly exceeded these projections in the field. Rebates were paid for 8,061 ENERGY STAR indoor light fixtures, 7,383 programmable thermostats for electric baseboard heaters (single and multi-packs), 524 indoor lighting timers, 2,139 heavy duty outdoor or pool timers, 221 power bars with integrated timers, and 3,781 dimmer switches.

6.2 Methodology

The process evaluation of the F&C components of the PD program consisted of a telephone survey of 47 chain store managers participating in this portion of the program. The implementation contractor provided a sample of 182 retail store locations that participated in this program component. Table 6-1 shows the estimated population, sample size and sampling error for the telephone survey. For the participant survey, the sampling error was $\pm 10.4\%$ at the 90% confidence level.

Table 6-1: Sample Size and Sampling Error

	2010		
			Sampling Error at 90% Confidence Interval
	Population	Sample Size	
Participants	182	47	$\pm 10.4\%$

The data from the interviewee responses were weighted at the store level to reflect the percentage of total savings from the sales of fixtures and controls for each store.

6.3 Retailer Participation

Almost all of the retailers interviewed said they had some familiarity with the stocking patterns or sales trends of the products rebated with close to two-thirds saying they were very familiar with these patterns or trends (Table 6-2). One respondent who was neither familiar nor unfamiliar was dropped from the survey.

Table 6-2: Familiarity with Stocking Patterns or Sales Trends of Rebated Products

	Chain Retailers
<i>Sample size</i>	47
Very Familiar	65%
Somewhat Familiar	34%
Neither Familiar nor Unfamiliar	1%

As shown in Table 6-3, nine out of ten retailers (90%) interviewed sold ENERGY STAR light fixtures and electronic baseboard thermostats in 2010. More than four out of five sold dimmer switches (83%) and around three out of five sold power bars with timers (72%), indoor light timers (70%), and heavy duty outdoor or pool timers (65%). Among the retailers who sold the rebated products at any time in 2010, over nine out of ten offered PD program rebates in October and November of 2010, except in the case of indoor light timers where close to nine out of ten offered the rebates.

Table 6-3: Rebated Light Fixtures and Controls

	ENERGY STAR Light Fixtures	Dimmer Switches	Power Bars with Timers	Indoor Light Timers	Heavy Duty Pool/Outdoor Timers	Electronic Baseboard Thermostats
<i>Sample size</i>	46	46	45	45	45	46
Sold It	90%	83%	72%	70%	65%	90%
<i>Sample size</i>	39	39	29	29	27	21
Received Rebate	97%	95%	94%	88%	90%	94%

Retailers offered various reasons for not participating in the program; the most common was that there were no sales made during the rebate period followed by confusion over the SKUs eligible for rebates (Table 6-4). However, these responses were based on a very small number of interviewees who had answered the question.

Table 6-4: Reasons for Not Participating

(Number of responses; multiple responses)

	ENERGY STAR Light Fixtures	Dimmer Switches	Power Bars with Timers	Indoor Light Timers	Heavy Duty Pool/Outdoor Timers	Electronic Baseboard Thermostats
<i>Sample size</i>	2	3	--	1	--	1
Confusion with SKUs included in program	1	1	--	--	--	--
No sales made during rebate period	1	1	--	--	--	1
Store is too small	--	1	--	--	--	--
Don't carry rebated products	--	--	--	1	--	--

6.4 Program Impact on Product Sales

For each of the four different products classes (light fixtures, power bars with timers, indoor light timers, and heavy duty outdoor or pool timers), retailers were asked what percentage of all those products sold in their stores had received rebates. In all cases, the percentages of rebated products sold during the program period (October and November 2010) was higher than the percentages of the same products sold in the preceding nine months (January through September 2010). The percentages of rebated products sold also dropped, in all cases, in the following month (December 2010). Sales of rebated power bars with timers and indoor and outdoor timers dropped moderately; however, sales of ENERGY STAR light fixtures dropped dramatically from 53% to 11% once the rebates were no longer in effect. It is also useful to compare the sales of rebated products to sales in October and November of 2009. Again, for all product classes, retailers estimated that year-over-year sales of the rebated products were higher in October-November 2010. The lowest average increase was a 10% increase for outdoor timers from 60% to 66%; the highest average increase was a 78% increase for power bars with timers from 36% to 64%. (Table 6-5)

Table 6-5: Average Percent of Rebated Product Sales

	Light Fixtures		Power Bars with Timers		Indoor Light Timers		Heavy Duty Pool/Outdoor Timers	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Jan – Sept 2010	6	28	15	44	17	37	15	36
Program Period (Oct – Nov 2010)	7	53	16	64	20	56	16	66
Dec 2010	7	11	14	51	19	40	14	48
Oct – Nov 2009	5	46	12	36	14	36	12	60

Retailers who reported increased sales during the program promotion period of October-November 2010 were asked to estimate the percentage of the increased sales that should be attributed to the program rebates. Retailers estimated that over two-thirds of the increase in sales of the rebated items over the preceding nine months of 2010 should be attributed to the program. In the case of ENERGY STAR light fixtures, retailers estimated that an average of 62% of the sales increase over October and November of 2009 should be attributed to the program and, in the case of outdoor timers, they estimated an average of 89% of the increased sales in December 2010 could be attributed to the program. Retailers expected the effect of the program to last an average of two months for power bars with timers and outdoor timers and an average of four months for indoor light timers. However, for power bars with timers, indoor light timers, and outdoor timers, retailers believed none of the increase in sales over October and November of 2009 should be attributed to the program. Note the very small sample sizes for interviewees who provided responses to the questions on increase over October - November of 2009, increase over December of 2010, and average number of months that the program effects were expected to last. (Table 6-6)

Table 6-6: Average Percentage of Sales Increase Attributed to Program

	ENERGY STAR Light Fixtures		Power Bars with Timers		Indoor Light Timers		Heavy Duty Pool/Outdoor Timers	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Jan – Sept 2010	7	77	9	70	8	74	9	69
Oct – Nov 2009	2	62	3	0	1	0	4	0
Dec 2010	--	--	--	--	--	--	3	89
Number of Months Follow-on Effect Expected to Last								
<i>Sample size</i>	0		1		2		2	
Average Number of Months	--		2		4		2	

In the absence of the program, more than two out of five retailers interviewed predicted that sales would have been lower for power bars with timers and indoor light timers. More than one in four predicted sales for outdoor timers would have also been lower. In the case of ENERGY STAR light fixtures, most retailers predicted that sales would have been the same without the program. This finding (as well as the others) reflects the weights applied to the data; four out of the seven retailers interviewed for ENERGY STAR light fixtures believed that sales would have been lower without the program, but the retailers with the larger sales volume believed sales would have been the same. Estimates of how much lower sales would have been without the program ranged from 33% for outdoor timers to 58% for power bars with timers. (Table 6-7)

Table 6-7: Predicted Sales in the Absence of the Program

	ENERGY STAR Light Fixtures	Power Bars with Timers	Indoor Light Timers	Heavy Duty Pool/Outdoor Timers
<i>Sample size</i>	7	18	21	20
Same	97%	58%	50%	73%
Lower	3%	41%	41%	27%
Higher	--	<1%	10%	--
Estimated Percentage Sales Would Have Been Lower				
<i>Sample size</i>	4	10	8	10
Oct-Nov 2010	46%	58%	54%	33%

Most of the retailers interviewed said there had been no other rebates offered during the program promotion period; again, this finding reflects the weights applied to the data with the larger retailers not having offered other rebates. The rebates offered were mostly in-store, with some not otherwise specified. The additional rebates offered ranged from \$3 to \$15; again, the percentages shown for the additional rebates are based on the small number of interviewees that answered these questions. (Table 6-8)

Table 6-8: Whether Other Rebates were Offered During the Program Promotion Period

	ENERGY STAR Light Fixtures	Power Bars with Timers	Indoor Light Timers	Heavy Duty Pool/Outdoor Timers
<i>Sample size</i>	8	19	21	19
Yes	2%	5%	8%	10%
No	98%	95%	92%	91%
Rebate/Promotion Source				
<i>Sample size</i>	1	3	2	3
In Store	100%	53%	50%	33%
Manufacturer	--	--	--	--
Sale (not specified)	--	47%	50%	68%
Average Value of Additional Rebates Offered				
<i>Sample size</i>	1	0	1	1
\$3 to \$15	100%	--	100%	100%

When asked about the importance of the program rebates to the customers' purchasing decisions, there was much more agreement among the retailers that the rebates were important. All of the retailers interviewed considered the program rebates extremely important or important to the customers' purchasing decisions for ENERGY STAR light fixtures; more than seven out of ten considered them extremely important or important for indoor light timers and outdoor timers; and almost seven out of ten considered them extremely important or important for power bars with timers. (Table 6-9)

Table 6-9: Importance of Program Rebate on Customers' Purchasing Decisions

	ENERGY STAR Light Fixtures	Power Bars with Timers	Indoor Light Timers	Heavy Duty Pool/Outdoor Timers
<i>Sample size</i>	8	18	20	20
Extremely important	78%	56%	41%	75%
Important	22%	13%	33%	3%
Neither important nor unimportant	--	10%	5%	3%
Not important	--	22%	5%	9%
Not at all important	--	--	17%	9%

6.5 Retailer Satisfaction

Overall satisfaction with the program was high among the retailers interviewed with more than three out of five saying they were very satisfied and an additional one-third saying they were satisfied. (Table 6-10)

Table 6-10: Overall Satisfaction with Program

	Chain Retailers
<i>Sample size</i>	46
Very satisfied	61%
Satisfied	33
Neither satisfied nor dissatisfied	5
Dissatisfied	1
Very dissatisfied	<1%

Of the two retailers who said they were dissatisfied, one felt that their customers had not understood or had not been aware of the program, and the other felt that the program had not included enough items. (Table 6-11)

Table 6-11: Reason for Dissatisfaction with Program

	Top Reason
<i>Sample size</i>	2
Customers didn't understand/weren't aware of the program	1
Not enough items were included	1

Retailers also provided additional feedback regarding specific aspects of the program. Again, satisfaction was high with more than nine out of ten interviewees very satisfied or satisfied with the program support and communications, the items covered by the program, and the program rebates; close to nine out of ten interviewees were very satisfied or satisfied with the program marketing and advertising. (Table 6-12)

Table 6-12: Satisfaction with Specific Aspects of Program

	Program Marketing and Advertising	Program Support and Communications	Items Covered by Program	Program Rebates
<i>Sample size</i>	46	46	46	46
Very satisfied	43%	24%	30%	37%
Satisfied	46	69	62	59
Neither satisfied nor dissatisfied	6	7	3	<1%
Dissatisfied	4	1	5	4
Very dissatisfied	1	--	1	--

However, the unweighted responses in Table 6-13 show a number of retailers had specific reasons for dissatisfaction; dissatisfaction was mostly associated with program marketing and advertising and the items covered by the program. The most common reason for dissatisfaction was that customers had not understood or had not been aware of the program followed by the perception that the program had not included enough items. One interviewee noted,

“[The store] didn't have a lot of information prior to the event, not sure if it was store level or not. Items had the rebate right off the retail price, so people questioned whether they were getting a rebate; [it] came off at the register so they didn't see they were getting a rebate; people prefer coupons.”

Table 6-13: Reasons for Dissatisfaction with Program Aspects

(Number of responses; multiple responses)

	Program Marketing and Advertising	Program Support and Communications	Items Covered by Program	Program Rebates
<i>Sample size</i>	4	2	5	2
Customers didn't understand or weren't aware of the program	2	1	1	1
Not enough items were included	--	--	3	--
Better/more advertising needed	2	--	--	--
Inadequate materials/preparation	--	1	--	--
Other	--	--	1	1

More than nine out of ten retailers said they had not experienced any barriers that limited their store's ability to participate in the program. (Table 6-14)

Table 6-14: Whether Barriers Limited Ability to Participate in Program

	Chain Retailers
Sample size	40
No	92%
Yes	8%

For the retailers that felt they had experienced some barriers, the most common barrier was the coupons arriving late. (Table 6-15)

Table 6-15: Barriers that Limited Ability to Participate in Program

(Multiple responses)

	Chain Retailers
Sample size	6
Coupons arrived later	50%
Small store	17%
Confusion at register	17%
Other	17%

Retailers had a host of recommendations for improving the program (Table 6-16). The most common recommendation, mentioned by almost one-half of the interviewees, was to have better signage, marketing, and local advertising. One interviewee noted,

“Improved education to the public is the biggest one, if they educate the public then the public will educate me, the consumer shouldn't have to read something on the shelf, he should come in knowing about it.”

Another said,

“For us, maybe some advertising locally in the smaller newspapers would be good. Advertise in local newspapers about the concept and actual savings.”

The second most common recommendation, mentioned by one-quarter of the interviewees was to include more products; this was followed by recommendations for more visits from the DSM Administrator representatives, running the program at a different time of the year, sending out materials earlier, and streamlining the coupon process. An interviewee noted,

“Bigger signage and banners would be better...a program rep came in for a couple of days on the weekend, that provided a big lift in sales on those days, in the future that would be a good idea to do.”

On the time of year, an interviewee said,

“Once we get into Christmas, people aren’t concentrating on buying light fixtures.”

Interviewees also noted that receiving materials earlier and streamlining the process would be helpful. One said,

“Would like to have had a little more information early on, early enough to order the stock so (we) would have extra pieces of the item; coupons would work better; we had to look up the item in the computer to show that the rebate had been applied.”

Table 6-16: Recommendations for Improving Program

(Multiple responses)

	Chain Retailers
<i>Sample size</i>	46
Better signage, marketing and local advertising	47%
Include more items/all ENERGY STAR items	25%
More visits from NSP representative	21%
Run program at different time of year	16%
Send materials and information earlier/advertise earlier	12%
Streamline coupon process	11%
More knowledgeable representatives	3%
Too much work for the store	3%
Other	12%

6.6 Retailer Characteristics

Over one-half of the retailers interviewed had 50 or more full-time equivalent employees at their location; fewer than one in five had less than 20 employees. (Table 6-17)

Table 6-17: Range of Full-Time Equivalent Workers Employed at Store

	Chain Retailers
<i>Sample size</i>	44
Fewer than 5	2%
5 to 9	10
10 to 19	6
20 to 49	28
50 to 99	29
100 to 249	24

The mean number of years the stores had been at their current location was 15; the median was 10. (Table 6-18)

Table 6-18: Number of Years Store has been in Current Location

	Chain Retailers
<i>Sample size</i>	46
Mean	15 years
Median	10 years

7 Process Evaluation: Appliances

7.1 Methodology

According to the work plan, NMR had planned to conduct a survey of customers who had purchased a rebated ENERGY STAR refrigerator or clothes washer. Retailers were to have provided the names of the qualifying appliance purchasers to the Program Administrator. However, the participating retailers refused to provide these names, citing confidentiality concerns. As a result, NMR switched the evaluation design and decided to piggyback the appliances rebate component questions on to the survey of retail store managers for fixtures and controls. Since the latter survey was conducted only with store managers at participating chain store locations, only managers at stores in the participating chains were asked the questions regarding appliances. NMR additionally conducted a survey of store managers at independent stores that participated in the program.

The Program Administrator/implementation contractor provided NMR with a sample of chain stores that included 23 retail locations for two retailers and 49 locations for independent retailers. We completed interviews with store managers at nine of the chain store locations and seven of the independent retailer locations. Prior to the survey, all of the retail store managers were contacted by the implementation contractor requesting their cooperation with the survey. Each interview took between 20 and 25 minutes to complete. NMR also completed in-depth interviews with Program Administrator staff and the implementation contractor's program manager. Additionally, during the course of the evaluation, NMR had numerous discussions with these program staff regarding various aspects of program administration and delivery.

7.2 Program Goals and Design

The Appliance Rebate portion (APP) of the 2010 Nova Scotia Power Down program (PD) began on October 1st 2010 and ran through the end of December 2010. The program was administered by the implementation contractor and was called the "Power Down Discount Program" in program literature. The APP portion was designed to achieve annual energy savings of 73,517 kWh through the promotion of ENERGY STAR refrigerators and clothes washers. The program offered \$50 rebates for these appliances at independent and chain retailers from October through December 2010.

Initially, APP was rolled out to chain retailers only. After hearing about the program, some independent retailers protested that the program was putting them at a competitive disadvantage and this resulted in their being added to the APP portion of the program in November. Independent retailers were allowed to apply for retroactive rebates on any sales of qualifying ENERGY STAR appliances that had been sold in October; additionally, the program was extended through the end of December for appliances only at both chain and independent retailers.

Appliance rebates greatly exceeded these projections in the field. Rebates were paid for 2,191 refrigerators and 2,025 clothes washers. Over one-half of the sales were achieved through an extension of the program into December 2010; it had originally been scheduled to run only through October and November. Although the program was expanded to include independent retailers and extended to December, the program targets remained the same. In the in-depth interview, the program manager at the

implementation contractor indicated that the budget, however, was adjusted to include the new retailers and extension of the time of the program. Note that even if the program had not been thus expanded and extended, it would have comfortably exceeded program targets based on the sales of clothes washers at just one of the retailers in any single month of the program period.

7.2.1 Rebate Processing and Verification

The implementation contractor's procedures for applying the rebates to product purchases and for processing and verifying the rebates have already been described in Section 5.5 of this document. Some of the described procedures in that section were drawn from a document provided to the Program Administrator by the implementation contractor in January 2011.

7.3 Retailer Participation

Overall, store managers at sixteen participating locations responded to the survey; nine of these were chain retailers while seven were independent retailers. Out of the sixteen managers that were interviewed, all but one (15 out of 16) were either somewhat or very familiar with the stocking patterns or sales trends of the rebated items. (Table 7-1)

Table 7-1: Familiarity with Stocking Patterns or Sales Trends

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	7	16
Very Familiar	5	5	10
Somewhat Familiar	4	1	5
Neither Familiar nor Unfamiliar	0	1	1

All sixteen of the retailers sold ENERGY STAR refrigerators and ENERGY STAR clothes washers at their stores in 2010. All sixteen retailers also rebated these appliances through the PD program. (Table 7-2)

Table 7-2: Rebated Appliances

	ENERGY STAR Refrigerators			ENERGY STAR Clothes Washers		
	Chain Retailers	Independent Retailers	Total	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	7	16	9	7	16
Sold It	9	7	16	9	7	16
Received Rebate	9	7	16	9	7	16

7.4 Program Impact on Product Sales

Table 7-3 shows the average percentages of overall ENERGY STAR refrigerator and clothes washer sales that were models that would qualify for rebates through the Power Down program for three different time periods. During the time period before the program began (January to September for chain retailers, January to October for independent retailers), the retailers reported that they had sold an overall average

of 54% of refrigerators and 61% of clothes washers that were qualifying models later rebated by the program. During the program period (September to December for chain retailers, October to December for independent retailers), chain retailers reported 73% of all refrigerators and 69% of all clothes washers sold were qualifying models that received a program rebate. Independent retailers reported slightly different averages during this time period with 61% of all refrigerators and 80% of all clothes washers sold being qualifying models that received a program rebate.

During January of 2011, after the program had ended, chain retailers estimated that 60% of refrigerators and 58% of clothes washers sold would be qualifying models that had previously been rebated by the program. Independent retailers were not asked to give a prediction. Finally, respondents were asked to estimate the percentage of all refrigerator and clothes washer sales during the program period in 2009 (October to December for chain retailers, November to December for independent retailers). Chain retailers estimated that 38% of refrigerators and 63% of clothes washers sold during this time period were qualifying models that were rebated through the program in 2010; independent retailers estimated that 63% of refrigerators and 55% of clothes washers were qualifying models that were rebated through the program in 2010. Some respondents had not worked at the store or in the department in 2009 and would not venture an estimate, which accounts for the smaller sample sizes.

Table 7-3: Average Percent Rebated Product Sales

	ENERGY STAR Refrigerators						ENERGY STAR Clothes Washers					
	<i>n</i>	Chain Retailers	<i>n</i>	Independent Retailers	Total <i>n</i>	Total	<i>n</i>	Chain Retailers	<i>n</i>	Independent Retailers	Total <i>n</i>	Total
Jan – Sept/Oct 2010	5	52%	5	56%	10	54%	5	62%	4	60%	9	61%
Program Period (Oct – Dec 2010)	6	73%	5	61%	11	68%	6	69%	5	80%	11	74%
Jan 2011	6	60%	--	--	6	60%	6	58%	--	--	6	58%
Oct – Dec 2009	3	38%	3	63%	6	51%	5	63%	2	55%	7	60%

Retailers who reported an increase in sales of qualifying models during the program period as compared with the time period before the program were asked the percentage of that increase that they attributed to the Power Down program. On average, chain retailers attributed 86% of the increase to the Power Down program and independent retailers attributed 67% of the increase to the program. When asked about the year-over-year increase from October/November-December of 2009 to the program period in 2010, independent retailers indicated that the increase in sales was 50% due to the program. One chain retailer and one independent retailer responded that the increase in sales of ENERGY STAR clothes washers from the time period before the program to the program period was 100% attributable to the Power Down program. (Table 7-4)

Table 7-4: Average Percentage of Sales Increase Attributed to Program

	ENERGY STAR Refrigerators						ENERGY STAR Clothes Washers					
	<i>n</i>	Chain Retailers	<i>n</i>	Independent Retailers	Total <i>n</i>	Total	<i>n</i>	Chain Retailers	<i>n</i>	Independent Retailers	Total <i>n</i>	Total
Increase from Jan-Oct/Nov 2010	4	86%	3	67%	7	78%	1	100%	1	100%	2	100%
Increase from Oct/Nov-Dec 2009	--	--	2	50%	2	50%	--	--	--	--	--	--

The respondents were asked if, in the absence of the rebates from the Power Down program, the sales of the rebated equipment would have been lower, the same, or higher. If they said the sales would have been lower, they were asked by what percentage the sales would have been lower. The majority of chain retailers predicted that sales of ENERGY STAR refrigerators (6 out of 8) and clothes washers (5 out of 8) would have been lower during the program period had the program not existed. However, three out of five independent retailers predicted that sales of refrigerators and clothes washers would have been the same in the absence of the program. None of the retailers thought that sales would have been higher.

Chain retailers who predicted that sales would have been lower estimated that sales would have been 25% lower for refrigerators and 23% lower for clothes washers in the absence of the program; one of the independent retailers who predicted sales would have been lower for refrigerators, estimated that sales would have been 50% lower, while for clothes washers independent retailers estimated that sales would have been 23% lower. (Table 7-5)

Table 7-5: Predicted Sales in the Absence of the Program

	ENERGY STAR Refrigerators			ENERGY STAR Clothes Washers		
	Chain Retailers	Independent Retailers	Total	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	8	5	13	8	5	13
Lower	6	2	8	5	2	7
Same	2	3	5	3	3	6
Higher	--	--	--	--	--	--
Average Estimated Percentage Sales Would Have Been Lower						
<i>Sample size</i>	5	1	6	3	2	5
Oct – Nov 2010	25%	50%	29%	23%	23%	23%

The majority of chain retailers indicated that, concurrently with the program rebates, other rebates or promotions had also been offered on ENERGY STAR refrigerators (6 out of 8) and ENERGY STAR clothes washers (7 out of 8). One-half (2 out of 4) of those rebates on refrigerators were valued at \$300 or more, while the other one-half ranged between \$50 and \$299. The majority of the clothes washer rebates (4 out of 6) were valued between \$100 and \$299.

One-half of the independent retailers (2 out of 4) reported the availability of additional rebates or promotions for both refrigerators and clothes washers, while the other one-half reported that there had not been any additional rebates or promotions. Of the two that reported additional rebates, one retailer valued the rebates at \$50 to \$99 for refrigerators while the other valued them at between \$100 and \$299. For clothes washers, one independent retailer valued the rebates at between \$3 and \$15 while the other valued them at between \$50 and \$99. (Table 7-6)

Table 7-6: Whether Other Rebates were Offered During the Program

	ENERGY STAR Refrigerators			ENERGY STAR Clothes Washers		
	Chain Retailers	Independent Retailers	Total	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	8	4	12	8	4	12
Yes	6	2	8	7	2	9
No	2	2	4	1	2	3
Value of Additional Rebates Offered						
<i>Sample size</i>	4	2	6	6	2	8
\$3 to \$15	--	--	--	0	1	1
\$50 to \$99	1	1	2	1	1	2
\$100 to \$299	1	1	2	4	0	4
More than \$300	2	0	2	1	0	1

When asked to rate the importance of the program rebate to the customer purchase decision, the majority of chain retailers rated rebate as either important or extremely important for both ENERGY STAR refrigerators (7 out of 8) and ENERGY STAR clothes washers (6 out of 8). In contrast, the majority of independent retailers (4 out of 5) stated that the rebate was either not important or neither important nor unimportant to customers' purchasing decisions to buy ENERGY STAR refrigerators. Three out of five independent retailers indicated that the rebate was either important or extremely important to customers' purchasing decisions to buy ENERGY STAR clothes washers, while two out of five stated that the rebate had not been important to the purchase decision for clothes washers. (

Table 7-7)

Table 7-7: Importance of Program Rebate on Customers' Purchasing Decisions

	ENERGY STAR Refrigerators			ENERGY STAR Clothes Washers		
	Chain Retailers	Independent Retailers	Total	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	8	5	13	8	5	13
Extremely important	2	1	3	2	1	3
Important	5	0	5	4	2	6
Neither important nor unimportant	1	1	2	1	--	1
Not important	--	3	3	1	2	3
Not at all important	--	--	--	--	--	--

7.5 Retailer Experience and Satisfaction with the Program

Overall, the vast majority of respondents (14 out of 16) stated that there had not been any barriers that limited their store's ability to participate in the program (Table 7-8). One chain retailer said that confusing signage had been a barrier to participation, while one independent retailer commented that they had been at a disadvantage to begin with due to the fact that the program had initially been rolled out to chain retailers only. (

Table 7-9)

Table 7-8: Whether Barriers Limited Ability to Participate in Program

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	7	16
No	8	6	14
Yes	1	1	2

Table 7-9: Barriers that Limited Ability to Participate in Program (Multiple Response)

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	1	1	2
Confusing signage	1	--	1

Rolled out to chain retailers initially	--	1	1

Independent retailers were asked additional questions about their experience with the program. Since the Power Down program had initially been rolled out to chain retailers only, independent retailers were asked how they had first become aware of the program. Respondents indicated a variety of sources: Nova Scotia Power, advertising at a chain store, notification from the head office, a call to the store manager, and a newspaper article. (Table 7-10)

Table 7-10: Source of First Awareness of Program

	Independent Retailers
<i>Sample size</i>	7
From Nova Scotia Power	2
Advertising at a chain store	2
From the head office	1
Call to the store manager	1
Newspaper article	1

While two out of the seven independent retailers were initially disappointed that they had not been included in the rebate program, three of the seven initially saw it as an opportunity to help sell appliances and generate more businesses. (Table 7-11)

Table 7-11: Initial Reaction to Program

	Independent Retailers
<i>Sample size</i>	7
It would help to sell appliances/generate business	3
Disappointed independent retailers not included	2
Needed more information	1
No reaction	1

In order to become involved in the program, three of the seven independent retailers contacted either the DSM Administrator or the implementation contractor, and two first gathered more information about the program (Table 7-12).

Table 7-12: Actions Taken to Become Involved in Program

	Independent Retailers
<i>Sample size</i>	7
Contacted NSP/implementation contractor	3
Got more information first	2
Advertised rebates	1
Signed up for the program	1

Only one independent retailer indicated any concerns about participating in the program, citing worry about collecting the reimbursements for the discounts. (Table 7-13)

Table 7-13: Concerns about Participation

Most Important Concern	Independent Retailers
<i>Sample size</i>	1
Reimbursements for discounts	1

Three out of four independent retailers stated that the most important reason for participating in the program was to be competitive, with the remaining retailer citing an increase in sales as the most important reason for participation. The second most important reasons for program participation cited by independent retailers were selling ENERGY STAR products (1 out of 2) and being environmentally conscious (1 out of 2). (Table 7-14)

Table 7-14: Reason for Program Participation

	Most Important Reason	Second Most Important Reason
<i>Sample size</i>	4	2
To be competitive	3	--
To increase sales	1	--
To sell ENERGY STAR products	--	1
Environmentally conscious	--	1

As Table 7-15 shows, independent retailers did not generally make many changes in the store due to program participation. Only one out of the seven retailers had changed stocking practices, while two of the seven had made changes to the placement or location of the rebated appliances, and two of the seven had changed advertising or promotions for the rebated appliances.

Table 7-15: Whether Changes Were Made due to Program Participation

	Stocking Practices	Placement/Location of Appliances	Advertising/Promotions for Appliances
<i>Sample size</i>	7	7	7
No	6	5	5
Yes	1	2	2

One-half of the independent retailers (3 out of 6) said that they had conducted their own marketing of the program, while the other one-half had not. (Table 7-16)

Table 7-16: Independent Retailer Marketing of Program

	Independent Retailers
<i>Sample size</i>	6
Yes	3
No	3

Table 7-17 shows the different ways independent retailers presented the Power Down rebate to customers. One-half of the respondents (3 out of 6) displayed the rebate next to the full price of the appliance, while two out of six respondents showed what the price would be after the rebate. The remaining respondent displayed only information about the rebate and required the customer to ask a sales associate about the value of the rebate.

Table 7-17: Presentation of Rebate/Incentive to Customer

(Multiple responses)

	Independent Retailers
<i>Sample size</i>	6
Displayed next to full price	3
Showed price after rebate	2
Displayed rebate information but ask sales associate rebate value	1

Independent retailers were asked whether or not they had advertised the ENERGY STAR appliances that had participated in the Power Down program between January and October 2010 as well as in November and December of 2009. Two out of five had advertised the products in November and December of 2009, and three out of four had advertised the products between January and October of 2010. Almost one-half (4 out of 9) had advertised these products in the newspaper, while one-third (3 out of 9) had used flyers, and two out of nine had advertised on radio or TV. The reported frequency of the advertising of ENERGY STAR appliances varied. (Table 7-18)

Table 7-18: Marketing of ENERGY STAR Appliances

	Nov-Dec 2009	Jan-Oct 2010
Sample size	5	4
Yes	2	3
No	3	1
Media Used to Market ES Appliances		
Sample size	9	
Newspaper	4	
Flyers	3	
Radio/TV	2	
Frequency of Advertising for ES Appliances		
Sample size	4	
Regular basis	1	
Every three weeks	1	
A few times per year	1	
Other	1	

Independent retailers joined the Power Down program in November though the program had actually started in October for chain retailers. Therefore, independent retailers were allowed to retroactively apply rebates to any sales of qualifying ENERGY STAR appliances that they had in October. When asked if the store had applied for retroactive rebates, three out of five independent retailers said that they had not, while two out of five said that they had. Both of the retailers who had applied for rebates reported that they had contacted customers who had purchased qualifying appliances in October. One of the two retailers who had not applied for retroactive rebates indicated that the reason they had not applied for the rebates was that it would have been too much work and the other said that the store had simply decided not to apply for them. (Table 7-19)

Table 7-19: Application of Retroactive Rebates

Applied for Retroactive Rebates	
<i>Sample size</i>	5
No	3
Yes	2
Contacted Customers Who Had Purchased Qualifying Appliances in October	
<i>Sample size</i>	2
Yes	2
No	--
Reason for Not Applying for Retroactive Rebate	
<i>Sample size</i>	2
Decided not to	1
Too much work	1

The independent retailers were asked about their procedures for tracking the rebates. One-half of the independent retailers (3 out of 6) reported that they had tracked the rebates by hand; the remaining one-half tracked rebates by computer, internal SKU numbers or filed for all five stores in the independent chain together. (Table 7-20)

Table 7-20: Method of Tracking Rebates/Incentives

	Independent Retailers
<i>Sample size</i>	6
Paper/By Hand	3
Filed for all 5 stores together	1
Computer	1
Internal SKU	1

The vast majority of respondents (14 out of 15) responded that, overall, they were either very satisfied or satisfied with the Power Down program. (Table 7-21)

Table 7-21: Overall Satisfaction with Program

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	6	15
Very satisfied	5	4	9
Satisfied	4	1	5
Neither satisfied nor dissatisfied	--	1	1
Dissatisfied	--	--	--
Very dissatisfied	--	--	--

When asked to indicate their level of satisfaction with specific aspects of the Power Down program, the majority of chain retailers were either satisfied or very satisfied with program marketing and advertising (7 out of 9), program support and communications (6 out of 8), items covered by the program (8 out of 9) and program rebates (9 out of 9). The majority of independent retailers were also satisfied or very satisfied with program support and communications (4 out of 6), items covered by the program (6 out of 6) and program rebates (6 out of 6). However, for program marketing and advertising, the majority of independent retailers (4 out of 6) indicated that they were neither satisfied nor dissatisfied (Table 7-22). Table 7-23 shows that the reason for independent retailer dissatisfaction with program marketing and advertising was that the stores had inadequate material or preparation for the program. This is likely related to their delayed participation in the program.

Table 7-22: Satisfaction with Specific Aspects of Program – Chain and Independent Retailers

		Chain Retailers	Independent Retailers	Total
Program Marketing and Advertising	<i>Sample size</i>	9	6	15
	Very satisfied	4	--	4
	Satisfied	3	2	5
	Neither satisfied nor dissatisfied	1	4	5
	Very dissatisfied	1	--	1
Program Support and Communications	<i>Sample size</i>	8	6	14
	Very satisfied	4	2	6
	Satisfied	2	2	4
	Neither satisfied nor dissatisfied	2	2	4
Items Covered by Program	<i>Sample size</i>	9	6	15
	Very satisfied	4	1	5
	Satisfied	4	5	9
	Neither satisfied nor dissatisfied	1	--	1
Program Rebates	<i>Sample size</i>	9	6	15
	Very satisfied	5	1	6
	Satisfied	4	5	9

Table 7-23: Reasons for Dissatisfaction

Program Marketing and Advertising	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	--	2	2
Inadequate materials/preparation	--	2	2

Independent retailers were asked about their satisfaction with other specific aspects of the program in addition to those asked to both chain and independent retailers. The majority were either satisfied or very satisfied with their interaction with the implementation contractor (4 out of 5), rebate processing (5 out of 6), and the tracking and reporting of rebates (4 out of 5). Two out of three retailers were satisfied with their interactions with DSM Administrator staff while one was neither satisfied nor dissatisfied. The low sample size for this question can be attributed to the fact that most retailers indicated having had no interaction with DSM Administrator staff. (Table 7-24)

Table 7-24: Satisfaction with Specific Aspects of Program – Independent Retailers

		Independent Retailers
Interaction with the implementation contractor	<i>Sample size</i>	5
	Very satisfied	2
	Satisfied	2
	Neither satisfied nor dissatisfied	1
Interaction with NSP Staff	<i>Sample size</i>	3
	Very satisfied	--
	Satisfied	2
	Neither satisfied nor dissatisfied	1
Rebate Processing	<i>Sample size</i>	6
	Very satisfied	1
	Satisfied	4
	Neither satisfied nor dissatisfied	1
Tracking and Reporting of Rebates	<i>Sample size</i>	5
	Very satisfied	1
	Satisfied	3
	Neither satisfied nor dissatisfied	1

When asked what aspects of the program had the greatest impact on sales, the majority (5 out of 6) responded that the fact that the rebate was instant at the register had the greatest impact. (Table 7-25)

Table 7-25: Impact of Program Aspects on Sales

	Greatest Impact	Other Impact (Multiple Response)
<i>Sample size</i>	6	3
Rebate is instant at register	5	--
Financial incentive	1	--
Environmentally friendly	--	2
NSP added credibility	--	1

Table 7-26 shows respondents' recommendations for improving the Power Down program. Almost one-half of the chain retailers (3 out of 7) suggested expanding the program to include more items or specifically including all ENERGY STAR items. Both chain (2 out of 7) and independent retailers (2 out of 3) suggested increasing the value of the rebates. One independent retailer noted,

"Possibly offer a higher rebate for purchasing a pair... (like a) fridge and stove or washer and dryer. Instead of \$50 each rebate, maybe \$150 if you buy both. This would possibly push customers to make an additional purchase instead of waiting to upgrade the other appliance."

Others mentioned including independent retailers from the beginning or running the program at a different time of year. One chain retailer remarked that since the program had been run around Christmas time, people had been focused on spending their money on gift items as opposed to refrigerators and clothes washers.

Table 7-26: Recommendations for Power Down Program

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	7	3	10
Higher rebates	2	2	4
Include more items/all ENERGY STAR items	3	--	3
Send materials/information/advertise earlier	--	1	1
Better signage/marketing/local advertising	1	--	1
Run program at a different time of year	1	--	1

7.6 Retailer Characteristics

All of the chain retailers (9 out of 9) had nine or fewer full time equivalent employees. Slightly fewer than one-half of the independent retailers (2 out of 5) had between five and nine employees, while slightly more than one-half (3 out of 5) had between 20 and 49 employees. (Table 7-27)

Table 7-27: Number of Full Time Equivalent Workers

	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	5	14
Fewer than 5	8	--	8
5 to 9	1	2	3
20 to 49	--	3	3

The average number of years the store had been at its current location was eight years for chain retailers, thirty-five years for independent retailers, and nineteen years overall. (Table 7-28)

Table 7-28: Number of Years at Location

Program Marketing and Advertising	Chain Retailers	Independent Retailers	Total
<i>Sample size</i>	9	6	15
Mean	8 years	35 years	19 years

Appendix A – Displaced Wattage Validation Calculations

For the 2010 program year, several retailers provided specific sales information including, in some cases, model numbers and wattages for CFLs sold as part of the program. Specific sales data were available for two-thirds (66%) of all CFLs sold through the program. By combining the wattage of bulbs sold through the program with the ENERGY STAR lighting equivalency wattage table, NMR was able to estimate the displaced wattage for 118,202 of the 179,591 CFLs sold through the 2010 PD program (Table A-1 and Table A-2). By multiplying the estimated displaced wattage by the number of bulbs and dividing by the number of bulbs with valid estimates for displaced wattage, NMR calculated that the weighted average displaced watts for the CFL portion of the 2010 PD program was 47.87. The above calculations rely entirely on the assumption that participants will install CFLs based on the ENERGY STAR equivalency values and do not take into account any of the CFLs for which wattage values were unavailable or any of the CFLs with wattages outside the range provided by the ENERGY STAR equivalency table. As such, these calculations are best used as a validation of the parameter from the New England study, which included on-site visits and the installation of data loggers.

Table A-1: ENERGY STAR Table of Lighting Equivalents*

Incandescent Bulbs (Watts)	Minimum Light Output (lumens)	ENERGY STAR Qualified Light Bulbs (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

*<http://www.energystar.gov/> - January 2010

Table A-2: Displaced Wattage Validation

CFL Wattage	Incandescent Equivalent	# of CFLs Sold	Estimated Displaced Wattage	Total Estimated Displaced Wattage
4	na	232	na	na
5	na	98	na	na
7	na	720	na	na
9	40	3,762	31	116,622
10	40	1,521	30	45,630
11	40	436	29	12,644
13	60	85,456	47	4,016,432
14	60	1,606	46	73,876
15	60	1,886	45	84,870
16	65	1,933	49	94,717
18	57	51		2,907
19	75	69	56	3,864
20	75	524	55	28,820
23	75	16,016	52	832,832
24	75	197	51	10,047
26	100	3,330	74	246,420
28	100	53	72	3,816
30	100	15	70	1,050
32	150	50	118	5,900
33	150	101	117	11,817
40	150	146	110	16,060
Unknown	na	61,389	na	na
Total	na	179,591	na	na

Appendix B - Questionnaire and Interview Guides

NOVA SCOTIA POWER RESIDENTIAL LIGHTING PROGRAM

MARKDOWN PHONE QUESTIONNAIRE – PARTICIPANT AND NONPARTICIPANT

INTRODUCTION

Hello, my name is _____ from _____ NMR Group I am calling on behalf of Nova Scotia Power, as part of an evaluation study of their energy efficiency programs. I'm not selling anything; we are trying to get feedback from customers about Nova Scotia Powers' energy efficiency programs so we can make these programs better. Your responses will be kept strictly confidential—that is your name will not be associated with any of your responses.

I1. May I speak with the head of the household?

1. Yes [GOTO INTRODUCTION]
2. No [SAY "Perhaps you can help me anyway." GOTO INTRODUCTION]

[READ IF THIS PERSON HASN'T HEARD IT YET.] Hello, my name is _____ from _____ NMR Group. I am calling on behalf of Nova Scotia Power, as part of an evaluation study of their energy efficiency programs. I'm not selling anything; we are trying to get feedback from customers about Nova Scotia Powers' energy efficiency programs so we can make these programs 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. Would that be okay?

[IF REFUSE, ASK "Can we schedule a more convenient time for you to conduct this survey?"

[SCHEDULED, IF NECESSARY, FOR: _____]

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 – SKIP TO AB1
5. (Don't know) – SKIP TO AB1

ES2. IF ES1=1, 2, OR 3: What do you know about the ENERGY STAR™ label or symbol?

ES3. I am going to read you a list of products. For each one, please tell me whether you know if you can purchase ENERGY STAR™-qualified models of that product at a store in your area. [1=Yes 2=No 9=Don't know / Refused]

[RANDOMIZE LIST]

1. Compact fluorescent light bulbs or CFLs
2. Light Fixtures
3. Refrigerators
4. Clothes washers
5. Heat Pumps

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. Compact fluorescent light bulbs usually do not look like regular incandescent bulbs. The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling soft-serve ice cream, and it fits in a regular light bulb socket. 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
5. (Don't know)

AB2. 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.

Are you familiar with CFL bulbs that...: **[ASK A-B]**

A. Have glass tubes bent into a U-shape or rectangular shape?

B. Look pretty much like regular light bulbs, but have a heavier base?

1. Yes

2. No

3. DK/Refused

[IF AB1=4 OR 5 AND AB2.A = 2 OR 3 and AB2.B = 2 OR 3 (Not familiar with any type of CFL at all) THEN GO TO D1]

PB. PURCHASES OF BULBS

PB2b1a. [ASK IF AB1 = 1, 2, OR 3 OR AB2.A=1 or AB2.B=1] Between October 1st and November 30th 2010, how many compact fluorescent light bulbs did your household purchase? 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: ‘Is it less than or more than 5 bulbs?’ AND WORK FROM THERE TO GET ESTIMATE.**

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 AND THAT WE WOULD CALCULATE THE TOTAL NUMBER OF CFLS. IF YES, GO TO PB2B1A1-PB2B1A12 SERIES.

999=DON’T KNOW]

PB2B1A. RECORD NUMBER OF CFL BULBS—October 1st - November 30th 2010

Purchases by pack size between October 1st and November 30th 2010:

PB2b1a1. Number of single CFL bulb-packs _____

PB2b1a2. Number of two-pack CFLs _____

PB2b1a3. Number of three-pack CFLs ____

PB2b1a4. Number of four-pack CFLs ____

PB2b1a5. Number of five-pack CFLs ____

PB2b1a6. Number of six-pack CFLs ____

PB2b1a7. Number of seven-pack CFLs ____

PB2b1a8. Number of eight-pack CFLs ____

PB2b1a9. Number of nine-pack CFLs ____

PB2b1a10. Number of ten-pack CFLs ____

PB2b1a11. Number of eleven-pack CFLs ____

PB2b1a12. Number of twelve-pack CFLs ____

[PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN PB2B1A1-PB2B1A12 AND INSERT THAT VALUE IN PB2B1A.]

PB2b1b. [ASK IF PB2B1a $\neq$ 0 or DK –AND- ES1=1, 2, OR 3]: We know that some CFLs have the ENERGY STAR label and some do not. Can you please tell me of the [Value from PB2B1A] CFL bulbs that you purchased in October and November, how many were ENERGY STAR™-qualified 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. 999=DON’T KNOW]

AGAIN, 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 AND THAT WE WOULD CALCULATE THE TOTAL NUMBER OF ENERGY STAR CFLS THEY PURCHASED BETWEEN OCTOBER 1ST AND NOVEMBER 30TH. IF YES, GO TO PB2B1B1-PB2B1B12 SERIES.

999=DON'T KNOW]

PB2B1B. RECORD NUMBER OF ENERGY STAR CFL BULBS—October 1st - November 30th 2010

Purchases by pack size of ENERGY STAR CFLs between October 1st and November 30th 2010:

PB2b1b1. Number of single CFL bulb packs ____

PB2b1b2. Number of two-pack ENERGY STAR CFLs ____

PB2b1b3. Number of three-pack ENERGY STAR CFLs ____

PB2b1b4. Number of four-pack ENERGY STAR CFLs ____

PB2b1b5. Number of five-pack ENERGY STAR CFLs ____

PB2b1b6. Number of six-pack ENERGY STAR CFLs ____

PB2b1b7. Number of seven-pack ENERGY STAR CFLs ____

PB2b1b8. Number of eight-pack ENERGY STAR CFLs ____

PB2b1b9. Number of nine-pack ENERGY STAR CFLs ____

PB2b1b10. Number of ten-pack ENERGY STAR CFLs ____

PB2b1b11. Number of eleven-pack ENERGY STAR CFLs ____

PB2b1b12. Number of twelve-pack ENERGY STAR CFLs ____

[PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL ENERGY STAR CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN PB2B1B1-PB2B1B12 AND INSERT THAT VALUE IN PB2B1B.]

PB2b2a. Thinking now of all compact fluorescent light bulbs that your household purchased in **all of 2010**. How many total compact fluorescent light bulbs did your household purchase from January 1st 2010 to December 31st 2010, **including** those purchased between October 1st and November 30th 2010? 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: ‘Is it less than or more than 5 bulbs?’ AND WORK FROM THERE TO GET ESTIMATE. 999=DON’T KNOW]**

AGAIN, 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 ALL OF 2010 AND THAT WE WOULD CALCULATE THE TOTAL NUMBER OF CFLS. IF YES, GO TO PB2b2A1-PB2b2A12 SERIES.

999=DON’T KNOW]

PB2b2A. RECORD NUMBER OF CFL BULBS— JANUARY – DECEMBER 2010_____

[CHECK: PB2B2a >= PB2B1a]

Purchases by pack size January-December 2010:

PB2b2a1. Number of single CFL bulb packs _____

PB2b2a2. Number of two-pack CFLs _____

PB2b2a3. Number of three-pack CFLs _____

PB2b2a4. Number of four-pack CFLs _____

PB2b2a5. Number of five-pack CFLs _____

PB2b2a6. Number of six-pack CFLs _____

PB2b2a7. Number of seven-pack CFLs _____

PB2b2a8. Number of eight-pack CFLs _____

PB2b2a9. Number of nine-pack CFLs _____

PB2b2a10. Number of ten-pack CFLs _____

PB2b2a11. Number of eleven-pack CFLs _____

PB2b2a12. Number of twelve-pack CFLs _____

[PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN PB2B2A1-PB2B2A12 AND INSERT THAT VALUE IN PB2B2A.]

PB2b2b. [ASK IF PB2B2a $\neq$ 0 or DK –AND- ES1=1, 2, OR 3]: As I had mentioned previously, some CFLs have the ENERGY STAR label and some do not. Can you please tell me of the [Value from PB2B2A] CFL bulbs that you purchased in all of 2010, how many were ENERGY STAR™-qualified 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. 999=DON’T KNOW]

AGAIN, 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 AND THAT WE WOULD CALCULATE THE TOTAL NUMBER OF ENERGY STAR CFLS THEY PURCHASED IN 2010. IF YES, GO TO PB2B2B1-PB2B2B12 SERIES.

999=DON’T KNOW]

PB2B2B. RECORD NUMBER OF ENERGY STAR CFL BULBS— JANUARY – DECEMBER 2010 _____

[CHECK: PB2B2b $\geq$ PB2B1b]

Purchases by pack size of ENERGY STAR CFLs January-December 2010:

PB2b2b1. Number of single CFL bulb packs _____

PB2b2b2. Number of two-pack ENERGY STAR CFLs _____

PB2b2b3. Number of three-pack ENERGY STAR CFLs _____

PB2b2b4. Number of four-pack ENERGY STAR CFLs ____

PB2b2b5. Number of five-pack ENERGY STAR CFLs ____

PB2b2b6. Number of six-pack ENERGY STAR CFLs ____

PB2b2b7. Number of seven-pack ENERGY STAR CFLs ____

PB2b2b8. Number of eight-pack ENERGY STAR CFLs ____

PB2b2b9. Number of nine-pack ENERGY STAR CFLs ____

PB2b2b10. Number of ten-pack ENERGY STAR CFLs ____

PB2b2b11. Number of eleven-pack ENERGY STAR CFLs ____

PB2b2b12. Number of twelve-pack ENERGY STAR CFLs ____

[PROGRAMMING NOTE: CALCULATE THE TOTAL NUMBER OF INDIVIDUAL ENERGY STAR CFL BULBS PURCHASED FROM THE DIFFERENT PACK SIZES IN PB2B2B1-PB2B2B12 AND INSERT THAT VALUE IN PB2B2B.]

[CATI PROGRAMMING NOTE: CALCULATE

PB2B1B÷PB2B1A =X (ACCEPT ONLY VALUES BETWEEN 0% AND 100%); AND

((PB2B2B-PB2B1B)÷(PB2B2A-PB2B1A)) =Y (ACCEPT ONLY VALUES BETWEEN 0% AND 100%)

FOR SKIP LATER IN SURVEY BEFORE PB5B]

[IF PB2b1a=0 OR DON'T KNOW THEN SKIP TO NP1a]

PB2e. Were any of [**Insert value from PB2B1A**] CFLs that you purchased in October and November specialty CFL bulbs? Specialty compact fluorescent light bulbs have the same low energy usage as regular spiral shaped compact fluorescent bulbs but are typically shaped differently or can be used in fixtures or applications where standard compact fluorescent bulbs are not acceptable. Specialty bulbs include vanity bulbs, fan bulbs, outside bulbs, three way bulbs and dimmable bulbs.

1. Yes – At least some of the CFLs purchased in October and November were specialty CFL bulbs: How many? _____
2. No – None of the CFLs purchased in October and November contained specialty CFL bulbs
3. (Don't know)

PB3. Thinking of **all** the compact fluorescent light bulbs that you purchased in October and November, why did you purchase these CFLs? [MULTIPLE RESPONSE; DO NOT READ]

1. (Low price)
2. (Rebate/utility coupon)
3. (Utility recommended)
4. (Wanted to try)
5. (Wanted long-life bulb)
6. (To save energy/electricity)
7. (To save money on electric bills)
8. (Good for environment)
9. (Other - specify _____)
10. (Don't Know)

PB4. : What were the names of the stores that you purchased compact fluorescent light bulbs from in October and November? [**RANDOMIZE AND READ, ASK L LAST. RESPONSES FOR A-K: 1. Yes, 2. No, 3. Don't know**]

- A. R6
- B. R1
- C. R8
- D. R5
- E. R2
- F. R4
- G. R7
- H. R9
- I. R11
- J. R10
- K. R3
- L. Any other stores I did not mention?
 - a. SPECIFY1 _____
 - b. SPECIFY2 _____
 - c. SPECIFY3 _____
 - d. SPECIFY4 _____

[IF PB4L = 2 or 3 SKIP PB5][REPEAT FOR EACH OTHER SPECIFIED IN PB4L]

PB5. What type of store is [PB4l]?

[RANDOMIZE AND READ, Ask L LAST. RESPONSES FOR A-K: 1. Yes, 2. No, 3. Don't know]

- A. Grocery store
- B. Price Club
- C. Home improvement store
- D. Hardware store
- E. Mass merchandise or discount department store
- F. Drug or convenience store
- G. Specialty lighting or electrical store
- H. Home furnishing stores
- I. Catalogs
- J. Internet
- K. Bargain store
- L. Any other types of stores I did not mention? [**SPECIFY**_____]

[IF PB4 DOES NOT INCLUDE AT LEAST ONE YES A-K THEN SKIP TO NP1c]

[CATI PROGRAMMING NOTE: CALCULATE

$PB2B1B \div PB2B1A = X$ (ACCEPT ONLY VALUES BETWEEN 0% AND 100%); AND

$((PB2B2B - PB2B1B) \div (PB2B2A - PB2B1A)) = Y$ (ACCEPT ONLY VALUES BETWEEN 0% AND 100%)

IF $X > Y$, ASK PB5B]

PB5b. The responses you provided earlier on your CFL purchases indicate that you bought a relatively higher percentage of ENERGY STAR™-qualified CFL bulbs in October and November of 2010 than in the other months of 2010. Why is that? [MULTIPLE RESPONSE; DO NOT READ]

- 1. (Lower prices than in other months of 2010)
- 2. (Sale on ENERGY STAR CFLs)
- 3. (Power Down program, NSPI, Utility rebate/ coupon)
- 4. (Manufacturer, other rebate / coupon)
- 5. (Utility recommended)
- 6. (Other - specify_____)
- 7. (Don't Know)

REPEAT QUESTIONS PB6a – FR7 SEPARATELY FOR EACH UNIQUE STORE NAME FROM PB4 – . KEEP A RUNNING COUNT OF PB6b EACH TIME THROUGH: PB6b COUNT SHOULD NOT EXCEED PB2b1. IF NECESSARY, REMIND RESPONDENT OF PB2b1, OR CHANGE PB2b1 VALUE IF RESPONDENT RECONSIDERS

KEEP A RUNNING COUNT OF PB6b EACH TIME THROUGH: PB6b COUNT SHOULD NOT EXCEED PB2b1. IF NECESSARY, REMIND RESPONDENT OF PB2b1, OR CHANGE PB2b1 VALUE IF RESPONDENT RECONSIDERS]

PB6b How many compact fluorescent light bulbs did you purchase at [PB4 STORE NAME] in October and November? 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. [REPEAT FOR EACH STORE] **[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. 999=DON'T KNOW]**

RECORD TOTAL NUMBER OF BULBS FROM [PB4 STORE NAME] _____

PB6c. IF PB2b1b $\neq$ 0 OR 999: Were any of the CFLs that you purchased in October and November at [PB4 STORE NAME] ENERGY STAR™-qualified CFLs?

1. Yes – At least some of the CFLs purchased in October and November at [PB4 STORE NAME] were ENERGY STAR™-qualified CFLs: How many? _____
2. No – None of the CFLs purchased in October and November ENERGY STAR™-qualified CFLs
3. (Don't know)

PB6a1. Do you recall seeing any promotions from Nova Scotia Power regarding the purchase and use of compact fluorescent light bulbs at [PB4 STORE NAME]? This may have included such things as representatives providing information, and signs, or posters. [REPEAT FOR EACH STORE].

1. Yes
2. No
3. (Don't Know)

PB6a2. Were you aware that Nova Scotia Power was offering a discount on the purchase of specific packages of compact fluorescent light bulbs at [PB4 STORE NAME]? [REPEAT FOR EACH STORE].

1. Yes
2. No
3. (Don't Know)

In October and November, Nova Scotia Power offered a discount of approximately \$x per CFL on packages of ENERGY STAR CFLs.

FR1. Did you have any plans to purchase CFLs before hearing about the discount on CFLs at [store name]?

1. Yes
2. No
3. (Don't Know)

Now I would like to ask you to consider the number of CFLs you would have purchased from [PB4 store name] in October and November if Nova Scotia Power had not offered a discount of \$X per CFL.

If Nova Scotia Power had not offered a discount on CFLs would you have...

FR2. Purchased the same number of CFLs

FR3. Purchased fewer CFLs

FR3a. [IF FR2 = YES] How many CFLs would you have been likely to purchase without a discount?

[RECORD TOTAL NUMBER OF BULBS]

FR4. Purchased more CFLs

FR3b. [IF FR2 = YES] How many CFLs would you have been likely to purchase without a discount?

[RECORD TOTAL NUMBER OF BULBS]

FR5. Purchased zero CFLs

FR6. How influential was the discount offered by Nova Scotia Power on your decision to purchase these [PB4 total] CFLs from [store name]? Please give your answer on a scale of 1 to 5, where 1 indicates the discount 'had no influence at all on you purchase decision' and 5 indicate that the discount was 'extremely influential to your purchase decision.'

C. CFL IN-SERVICE RATE

C2. Earlier you said that you purchased a total of [#PB2b1] CFL bulbs in October and November. How many of these [#PB2b1] 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, OR ROUND UP. IF 'DON'T KNOW,' PROBE FOR BEST GUESS TO NARROW IN ON A NUMBER.]

[RECORD NUMBER] _____ [CHECK TO MAKE SURE C2 <= PB2b1a]

[IF #C2(#installed)= PB2b1a (#purchased), GO TO #C10(Installed CFLs)]

Removed CFLs

C3. How many of these compact fluorescent bulbs did you install but later remove? Again, I'm asking only about the [#PB2b1a] compact fluorescent light bulbs you purchased in October and November.

ENTER NUMBER OF BULBS _____

[CHECK C2 + C3 <= PB2b1a] [IF NOT READ: Earlier you said that you purchased a total of [#PB2b1a] CFL bulbs in October and November. You also said that [C2+C3] of these bulbs are currently installed or have been removed. Can we revise the total bulbs currently installed and removed?] [GO TO C2]

[IF #C3 > 0, ASK #C4a ELSE SKIP TO #C6 (Never Installed)]

C4a. What was the main reason you removed the bulb(s) from service? [SINGLE MENTION, DON'T READ LIST]

[IF 'DON'T KNOW' THEN GO TO #C5]

C4b-d. Were there other reasons? [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)
17. (Other [Specify _____])
18. (Don't know)

C5. What did you do with the bulbs you removed? [MULTIPLE MENTION, DON'T READ LIST.]

1. (Threw away)
2. (Put them away, stored them)
4. (Returned to retail store)
5. (Gave away)
6. (Other [Specify _____])
7. (Don't remember)

[IF #C2(#installed)+#C3(#removed)) = #PB2b1a (#purchased) THEN SKIP TO #C10 ELSE ASK #C6(Never Installed).]

Never Installed CFLs

C6. [CALCULATE #PB2b1a)-#C2(#installed)-#C3(#removed), ENTER NUMBER OF BULBS NEVER INSTALLED _____]

[IF #C6 > 0 THEN ASK #C7a ELSE GO TO #C10 (Installed CFLs)]

C7a. Based on the information you have provided, there are a total [#C6] CFL bulbs that you purchased in October and November but have never installed. What is the main reason why the remaining [#C6] bulb(s) have never been installed at this address? [SINGLE MENTION, DON'T READ]

[IF 'DON'T KNOW' THEN GO TO #C8a]

C7b-d. Are there other reasons? [MULTIPLE MENTIONS, DON'T READ]

1. (Didn't fit the fixture for which it was intended)
2. (Didn't work with my 3-way switch or dimmer control)
3. (Not satisfied with light quality)
4. (Haven't got around to it or forgot)
5. (Bulbs are too heavy for intended fixture)
6. (Bulbs are broken)
7. (Bought as spares)
8. (Bought as gifts)
9. (Only recently received the bulbs)
10. (Other [Specify _____])
11. (Don't know)

C8a. What did you do with the bulbs you never installed at this address? [DO NOT READ. PROBE IF NEEDED. CHECK ALL THAT APPLY.]

1. (Threw away)
2. (Put them away, stored them)
3. (Returned to retailer)
4. (Gave away)
5. (Installed at some other place)
6. (Other [Specify _____])
7. (Don't remember)

C8b. [IF #C8a=5] For the bulb(s) installed at another place, did you install them in Nova Scotia?

1. Yes
2. No
3. (Don't know)

C8c. [IF #C8a=5] Were the bulb(s) installed at another home or a business?

1. Home
2. Business

3. (Don't know)

C9. How many of the [INSERT #C6] bulbs you have yet to install do you plan on installing within the coming year?

ENTER NUMBER OF BULBS _____

[NOTE: IF #C2 (#installed) = 0, THEN SKIP to #C13 (Satisfaction)]

Installed CFLs

C10. Of the _____[INSERT #C2(number installed)] compact fluorescent bulbs that you purchased and then installed, how many

- 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—a regular light bulb.'] [ENTER NUMBER OF BULBS.] _____
- B. replaced another compact fluorescent bulb [ENTER NUMBER OF BULBS.] _____
- C. were put in new fixtures or fixtures that didn't have bulbs before [ENTER NUMBER OF BULBS.] _____

C11. In which rooms in your home did you install the [INSERT #C2] compact fluorescent bulbs? DO NOT READ. ACCEPT MULTIPLE.

- 1. (Living room or Family room)
- 2. (Kitchen)
- 3. (Dining Room)
- 4. (Bedrooms)
- 5. (Bathrooms)
- 6. (Office)
- 7. (Hall or Foyer)
- 8. (Garage)
- 9. (Exterior/ Outside)
- 10. (Closet)
- 11. (Utility room)
- 12. (Basement)
- 13. Other (specify) _____
- 14. Other (specify) _____

[REPEAT QUESTION C12a – C12c FOR EACH ROOM MENTIONED IN QUESTION C11]

C12a. How many compact fluorescent bulbs were installed in the [C11 ROOM]?

ENTER NUMBER OF BULBS _____

C12b. What type of bulb was replaced in [C11 ROOM]? MULTIPLE RESPONSE.

1. Incandescent
2. Another compact fluorescent bulb
3. Nothing, it is a new light source
4. Other (Specify)

C12c. [IF C12b= 1 OR 2] What was the wattage of the bulb(s) you replaced in [C11 ROOM]? (If there was more than one bulb, use the average wattage)

ENTER AVERAGE WATTAGE _____

C13. [IF #C2>0 (has CFLs installed) or #C3>0(has removed CFLs), OTHERWISE GO TO #FP1]
Overall, how satisfied are you with the compact fluorescent light bulbs you bought through the Nova Scotia Power program in October and November? 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
6. (Don't know/Refused)

C14. [IF #C13 = 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)

17. (Other [Specify _____])
18. (Don't know)

NP. NON-PARTICIPANTS

[ASK ONLY NON-PARTICIPANTS]

NP1a. [IF PB2b2a=0 (haven't purchased CFLs in past year}] Have you ever purchased a compact fluorescent bulb?

1. Yes
2. No
3. (Don't Know/Refused)

NP1b. [IF NP1a=2 OR 3, 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 PB2b1a=0 and PB2b2a>0, READ:] Why did you not purchase any compact fluorescent light bulbs in October and November, 2010?

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 not 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)
16. (Other **[SPECIFY]** _____)
17. (Don't know)

NP1c. [IF NP1a=1 OR PB2b2a>0] Why have you purchased compact fluorescent light bulbs?
[MULTIPLE RESPONSE; DO NOT READ]

1. (Low price)
2. (Rebate/utility coupon)
3. (Utility recommended)
4. (Wanted to try)
5. (Wanted long-life bulb)
6. (To save energy/electricity)
7. (To save money on electric bills)
8. (Good for environment)
9. (Other - specify_____)
10. (Don't Know)

NP3a. Do you recall any seeing any promotions from Nova Scotia Power 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
3. (Don't Know)

NP3b. Were you aware that Nova Scotia Power 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
3. (Don't Know)

NP4a. Are there any compact fluorescent bulbs currently installed in your home?

1. Yes
2. No
3. (Don't Know/Refused)

NP4b. [IF NP4a=1] How many compact fluorescent bulbs are currently installed in your home?

ENTER NUMBER _____

NP5. [IF NP4a=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
6. (Don't know/Refused)

NP6. [IF #NP5 = 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)

17. (Other [Specify _____])
18. (Don't know)

FP. FUTURE PURCHASES

[ASK RESPONDENTS WHO ARE AWARE OF CFLs: IF AB1 = 1, 2, OR 3 OR AB2.A=1 or AB2.B=1]

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."
[11=DON'T KNOW]

FP2. [IF #FP1 <= 5] 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. (Other [SPECIFY: _____])
10. (Don' know)

CUSTOMER 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 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)
6. Apartment building that has fewer than five stories
7. Apartment building that has five or more stories
8. Other [SPECIFY: _____]
9. (Don't know/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
3. (Don't Know/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 _____)
8. (DK/RF)

D6. Including your self, 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? [DO NOT 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)
7. (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)
6. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2009? 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
9. (Refused)

D10. [DO NOT READ] Gender

1. Male
2. Female

RETAIL STORE MANAGER QUESTIONNAIRE NSPI RETAIL MARKDOWN PROGRAM: CONTROLS, FIXTURES, AND APPLIANCE REBATES

FINAL: December 15, 2010

Hello may I please speak with [INSERT CONTACT NAME OR ASK FOR STORE MANAGER]?

1 Yes [GOTO INTRODUCTION]

2 No [SAY "Perhaps you can help me anyway." GOTO INTRODUCTION]

INTRODUCTION

Hello, my name is _____, from NMR Group. I am calling on behalf of the Power Down Program from Nova Scotia Power.

I1. [<IF CONTACT NAME> IS BLANK THEN SKIP TO I2]

Hello, may I please speak with [USE CONTACT NAME, IF AVAILABLE]?

Contact available [SKIP TO Q1] 1

Contact currently unavailable [ARRANGE CALL BACK] 2

I2. According to our records, your store has participated in the Power Down Program from Nova Scotia Power. NMR Group has been engaged by Nova Scotia Power to conduct an evaluation of this program. We have a few questions about your store's participation in this program. Specifically, I'd like to speak with someone in your store who is knowledgeable about the stocking and supplying of products that were rebated by the program. These products include controls, fixtures, and appliances. Would that be you?

[IF THEY WANT VERIFICATION OF THE LEGITIMACY OF THE RESEARCH, TELL THEM TO CALL [Name] OF NSPI AT [Phone number] OR [Name] OF NSPI AT [Phone number]

Person responsible available 1 [CONTINUE TO I3]

Person responsible currently unavailable . [ARRANGE CALL BACK] 2

No person responsible for stocking or management of products 3 [CONTINUE INTERVIEW WITH STORE MANAGER - CONTINUE TO I3]

Don't know 4 [CONTINUE INTERVIEW WITH STORE MANAGER - CONTINUE TO I3]

Refused -98 [THANK AND TERMINATE]

I3. How familiar are you with the stocking patterns or sales trends for the controls, light fixtures, and appliances that you sell? Would you say you are:

1. Not at all familiar
2. Not familiar
3. Neither familiar nor unfamiliar
4. Somewhat familiar -[SKIP TO Q1]
5. Very familiar - [SKIP TO Q1]
9. Don't know / Refused

I4. Is there someone else at this store who would be familiar with the stocking patterns or sales trends for the controls, light fixtures, and appliances that you sell?

1. Yes – ASK TO SPEAK TO THAT PERSON, ARRANGE CALL BACK IF UNAVAILABLE—BE SURE RECORD NAME AND CONFIRM BEST NUMBER TO REACH HIM]
2. No - [THANK AND TERMINATE]
8. Refused [THANK & TERMINATE]
9. Don't know [THANK AND TERMINATE]

Q1. What is your job title?

Q2. I am going to read you a list of types of products that were rebated through the Nova Scotia Power Power Down program, which ran from October 1 to November 30th, 2010. For each one, please tell me:

(a) if the product was sold in your store at any time in 2010; and

(b) if the product received the Power Down program rebate at your store in October and November of 2010.

(1=Yes, 2=No, 8=Refused, 9=Don't know)

		Q2a	Q2b

		Sold it	Received rebate
1	ENERGY STAR Light fixtures		
2	Dimmer switches		
3	Power bars with timers		
4	Indoor Light Timers		
5	Heavy Duty Pool or Outdoor Timers		
6	Electronic Baseboard Thermostats		
7	ENERGY STAR Refrigerators		
8	ENERGY STAR Clothes washers		

Q2c. FOR ANY PRODUCT WHERE Q2a=1 (sold in 2010) and Q2b=2 (not rebated by Power Down program): Why did your store not participate in the Power Down program for [PRODUCT TYPE]?

IF Q2B1=1

ENERGY STAR LIGHT FIXTURES

Q3. I now have a few questions about your sales of light fixtures.

- A. Roughly what percent of ALL the light fixtures that your store sold between January and September 2010, BEFORE the Power Down program promotion, were ENERGY STAR light fixtures that were later rebated by the program?
- B. Now thinking of your sales of light fixtures DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the light fixtures that your store sold were ENERGY STAR light fixtures that were rebated by the Power Down program?
- C. And roughly what percent of ALL the light fixtures that your store sold in December 2010, AFTER the program promotion period, were ENERGY STAR light fixtures that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the light fixtures that your store sold in October and November OF 2009 were ENERGY STAR light fixtures that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
LIGHT FIXTURES	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q4. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED FIXTURES ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of fixtures that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates? ____%
- B. [IF % SALES OF REBATED FIXTURES ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of fixtures that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November **2009**, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? ____%
- C. [IF % SALES OF REBATED FIXTURES ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of fixtures that qualified for the Power Down rebate was higher after the Power Down program period in December 2010

than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q4C >= 0%: How many more months do you expect this follow-on effect of the program will last? ____

Q5.

- A. During the October-November promotion, the Power Down program provided a rebate of \$15 for each ENERGY STAR light fixture sold in your store. If this rebate had not been available, do you think your October-November sales of ENERGY STAR light fixtures would be about the same, lower, or higher?

1. Same [SKIP TO Q6A]
2. Lower
3. Higher [SKIP TO Q6A]
8. Refused [SKIP TO Q6A]
9. Don't know [SKIP TO Q6A]

- B. [IF Q5A=2 (lower)]: By what percentage do you estimate your store's sales of these ENERGY STAR light fixtures would have been lower during the October-November promotion period if the \$15 Power Down program rebate had not been available?

RECORD PERCENTAGE ____%; [998=Refused; 999=Don't know/Not sure/Can't remember]

- C. I want to make sure I understand you correctly when you say your store's sales of ENERGY STAR light fixtures would be [% FROM Q5B] lower without the Power Down program rebate. So you're saying that if you sold 100 ENERGY STAR light fixtures in a given week with the program discounts, you would have only sold [100 - (% FROM Q5B * 100)] ENERGY STAR light fixtures that week without the program discounts?

IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q5B

Q6A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on light fixtures?

1. Yes
2. No
8. Refused
9. Don't know

Q6B. [IF Q6A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____
5. Other Federal Government \$ _____
6. Provincial Government \$ _____
7. City/Town/Municipality \$ _____

8. Other \$ _____
98. Refused
99. Don't know

Q7. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the ENERGY STAR light fixtures? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=2

DIMMER SWITCHES

Q8. I now have a few questions about your sales of dimmer switches.

- A. Roughly what percent of ALL the dimmer switches that your store sold between January and September 2010, BEFORE the Power Down program promotion, were dimmer switches that were later rebated by the program?
- B. Now thinking of your sales of dimmer switches DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the dimmer switches that your store sold were dimmer switches that were rebated by the Power Down program?
- C. And roughly what percent of ALL the dimmer switches that your store sold in December 2010, AFTER the program promotion period, were dimmer switches that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the dimmer switches that your store sold in October and November OF 2009 were dimmer switches that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
DIMMER SWITCHES	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q9. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED DIMMER SWITCHES ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of dimmer switches that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates?
_____ %
- B. [IF % SALES OF REBATED DIMMER SWITCHES ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of dimmer switches that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates?
_____ %
- C. [IF % SALES OF REBATED DIMMER SWITCHES ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of dimmer

switches that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q9C >= 0%: How many more months do you expect this follow-on effect of the program will last? _____

Q10.

- A. During the October-November promotion, the Power Down program provided a rebate of \$3 for each dimmer switch sold in your store. If this rebate had not been available, do you think your October-November sales of dimmer switches would be about the same, lower, or higher?

1. Same [SKIP TO Q11A]
2. Lower
3. Higher [SKIP TO Q11A]
8. Refused [SKIP TO Q11A]
9. Don't know [SKIP TO Q11A]

- B. [IF Q10A=2 (lower)]: By what percentage do you estimate your store's sales of these dimmer switches would have been lower during the October-November promotion period if the \$3 Power Down program rebate had not been available?

RECORD PERCENTAGE _____%; [998=Refused; 999=Don't know/Not sure/Can't remember]

- C. I want to make sure I understand you correctly when you say your store's sales of dimmer switches would be [% FROM Q10B] lower without the Power Down program rebate. So you're saying that if you sold 100 dimmer switches in a given week with the program discounts, you would have only sold [100 - (% FROM Q10B * 100)] dimmer switches that week without the program discounts?

IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q10B

Q11A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on dimmer switches?

1. Yes
2. No
8. Refused
9. Don't know

Q11B. [IF Q11A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____
5. Other Federal Government \$ _____
6. Provincial Government \$ _____
7. City/Town/Municipality \$ _____

8. Other \$ _____
98. Refused
99. Don't know

Q12. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase dimmer switches? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=3

POWER BARS WITH TIMERS

Q13. I now have a few questions about your sales of power bars with timers.

- A. Roughly what percent of ALL the power bars with timers that your store sold between January and September 2010, BEFORE the Power Down program promotion, were power bars with timers that were later rebated by the program?
- B. Now thinking of your sales of power bars with timers DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the power bars with timers that your store sold in were power bars with timers that were rebated by the Power Down program?
- C. And roughly what percent of ALL the power bars with timers that your store sold in December 2010, AFTER the program promotion period, were power bars with timers that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the power bars with timers that your store sold in October and November OF 2009 were power bars with timers that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
POWER BARS WITH TIMERS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q14. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED POWER BARS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of power bars that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates? ____%
- B. [IF % SALES OF REBATED POWER BARS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of power bars that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November **2009**, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? ____%
- C. [IF % SALES OF REBATED POWER BARS ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of power bars that qualified for the Power Down rebate was higher after the Power Down program period in

December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q14C $\geq$ 0%: How many more months do you expect this follow-on effect of the program will last? _____

Q15.

- A. During the October-November promotion, the Power Down program provided a rebate of \$5 for each power bar with a timer sold in your store. If this rebate had not been available, do you think your October-November sales of power bars with timers would be about the same, lower, or higher?

1. Same [SKIP TO Q16A]
2. Lower
3. Higher [SKIP TO Q16A]
8. Refused [SKIP TO Q16A]
9. Don't know [SKIP TO Q16A]

- B. [IF Q15A=2 (lower)]: By what percentage do you estimate your store's sales of these power bars with timers would have been lower during the October-November promotion period if the \$15 Power Down program rebate had not been available?

RECORD PERCENTAGE _____%; [998=Refused; 999=Don't know/Not sure/Can't remember]

- C. I want to make sure I understand you correctly when you say your store's sales of power bars with timers would be [% FROM Q15B] lower without the Power Down program rebate. So you're saying that if you sold 100 power bars with timers in a given week with the program discounts, you would have only sold [100 - (% FROM Q15B * 100)] power bars with timers that week without the program discounts?

IF RESPONSE IS $\neq$ YES THEN CLARIFY RESPONSE TO Q15B

Q16A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on power bars with timers?

1. Yes
2. No
8. Refused
9. Don't know

Q16B. [IF Q16A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____
5. Other Federal Government \$ _____

- 6. Provincial Government \$ _____
- 7. City/Town/Municipality\$ _____
- 8. Other \$ _____
- 98. Refused
- 99. Don't know

Q17. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase power bars with timers? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=4

INDOOR LIGHT TIMERS

Q18. I now have a few questions about your sales of indoor light timers.

- A. Roughly what percent of ALL the indoor light timers that your store sold between January and September 2010, BEFORE the Power Down program promotion, were indoor light timers that were later rebated by the program?
- B. Now thinking of your sales of indoor light timers DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the indoor light timers that your store sold in were indoor light timers that were rebated by the Power Down program?
- C. And roughly what percent of ALL the indoor light timers that your store sold in December 2010, AFTER the program promotion period, were indoor light timers that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the indoor light timers that your store sold in October and November OF 2009 were indoor light timers that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
INDOOR LIGHT TIMERS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q19. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED INDOOR LIGHT TIMERS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of indoor light timers that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates?
_____ %
- B. [IF % SALES OF REBATED INDOOR LIGHT TIMERS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of indoor light timers that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? _____ %
- C. [IF % SALES OF REBATED INDOOR LIGHT TIMERS ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of indoor

light timers that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q19C $\geq$ 0%: How many more months do you expect this follow-on effect of the program will last? _____

Q20.

- A. During the October-November promotion, the Power Down program provided a rebate of \$3 for each indoor light timer sold in your store. If this rebate had not been available, do you think your October-November sales of indoor light timers would be about the same, lower, or higher?

1. Same [SKIP TO Q21A]
2. Lower
3. Higher [SKIP TO Q21A]
8. Refused [SKIP TO Q21A]
9. Don't know [SKIP TO Q21A]

- B. [IF Q20A=2 (lower)]: By what percentage do you estimate your store's sales of these indoor light timers would have been lower during the October-November promotion period if the \$3 Power Down program rebate had not been available?

RECORD _____ PERCENTAGE _____%;
[998=Refused; 999=Don't know/Not sure/Can't remember]

- C. I want to make sure I understand you correctly when you say your store's sales of indoor light timers would be [% FROM Q20B] lower without the Power Down program rebate. So you're saying that if you sold 100 indoor light timers in a given week with the program discounts, you would have only sold [100 - (% FROM Q20B * 100)] indoor light timers that week without the program discounts?

IF RESPONSE IS $\neq$ YES THEN CLARIFY RESPONSE TO Q20B

Q21A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on indoor light timers?

1. Yes
2. No
8. Refused
9. Don't know

Q21B. [IF Q21A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____

- 5. Other Federal Government \$ _____
- 6. Provincial Government \$ _____
- 7. City/Town/Municipality \$ _____
- 8. Other \$ _____
- 98. Refused
- 99. Don't know

Q22. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase indoor light timers? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=5

HEAVY DUTY POOL OR OUTDOOR TIMERS

Q23. I now have a few questions about your sales of heavy duty pool or outdoor timers.

- A. Roughly what percent of ALL the heavy duty pool or outdoor timers that your store sold between January and September 2010, BEFORE the Power Down program promotion, were heavy duty pool or outdoor timers that were later rebated by the program?
- B. Now thinking of your sales of heavy duty pool or outdoor timers DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the pool or outdoor timers that your store sold in were pool or outdoor timers that were rebated by the Power Down program?
- C. And roughly what percent of ALL the heavy duty pool or outdoor timers that your store sold in December 2010, AFTER the program promotion period, were pool or outdoor timers that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the heavy duty pool or outdoor timers that your store sold in October and November OF 2009 were pool or outdoor timers that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
HEAVY DUTY POOL OR OUTDOOR TIMERS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q24. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED POOL OR OUTDOOR TIMERS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of pool or outdoor timers that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates?
_____ %
- B. [IF % SALES OF REBATED POOL OR OUTDOOR TIMERS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of pool or outdoor timers that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November **2009**, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? _____ %

- C. [IF % SALES OF REBATED POOL OR OUTDOOR TIMERS ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of pool or outdoor timers that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%
- D. IF Q24C $\geq$ 0%: How many more months do you expect this follow-on effect of the program will last? _____

Q25.

- A. During the October-November promotion, the Power Down program provided a rebate of \$15 for each pool or outdoor timer sold in your store. If this rebate had not been available, do you think your October-November sales of heavy duty pool or outdoor timers would be about the same, lower, or higher?
1. Same [SKIP TO Q26A]
 2. Lower
 3. Higher [SKIP TO Q26A]
 8. Refused [SKIP TO Q26A]
 9. Don't know [SKIP TO Q26A]
- B. [IF Q25A=2 (lower)]: By what percentage do you estimate your store's sales of these heavy duty pool or outdoor timers would have been lower during the October-November promotion period if the \$15 Power Down program rebate had not been available?
RECORD PERCENTAGE _____%; [998=Refused; 999=Don't know/Not sure/Can't remember]
- C. I want to make sure I understand you correctly when you say your store's sales of heavy duty pool or outdoor timers would be [% FROM Q25B] lower without the Power Down program rebate. So you're saying that if you sold 100 heavy duty pool or outdoor timers in a given week with the program discounts, you would have only sold [100 - (% FROM Q25B * 100)] pool or outdoor timers that week without the program discounts?
IF RESPONSE IS $\neq$ YES THEN CLARIFY RESPONSE TO Q25B

Q26A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on heavy duty pool or outdoor timers?

1. Yes
2. No
8. Refused
9. Don't know

Q26B. [IF Q26A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____

- 3. Manufacturer2 (specify) \$ _____
- 4. Natural Resources Canada \$ _____
- 5. Other Federal Government \$ _____
- 6. Provincial Government \$ _____
- 7. City/Town/Municipality \$ _____
- 8. Other \$ _____
- 98. Refused
- 99. Don't know

Q27. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase heavy duty pool or outdoor timers? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=6

ELECTRONIC BASEBOARD THERMOSTATS

Q28. I now have a few questions about your sales of electronic baseboard thermostats.

- A. Roughly what percent of ALL the electronic baseboard thermostats that your store sold between January and September 2010, BEFORE the Power Down program promotion, were electronic baseboard thermostats that were later rebated by the program?
- B. Now thinking of your sales of electronic baseboard thermostats DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the electronic baseboard thermostats that your store sold in were electronic baseboard thermostats that were rebated by the Power Down program?
- C. And roughly what percent of ALL the electronic baseboard thermostats that your store sold in December 2010, AFTER the program promotion period, were electronic baseboard thermostats that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the electronic baseboard thermostats that your store sold in October and November OF 2009 were electronic baseboard thermostats that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
ELECTRONIC BASEBOARD THERMOSTATS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q29. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED ELECTRONIC BASEBOARD THERMOSTATS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of electronic baseboard thermostats that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates? ____%
- B. [IF % SALES OF REBATED ELECTRONIC BASEBOARD THERMOSTATS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of electronic baseboard thermostats that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? ____%

- C. [IF % SALES OF REBATED ELECTRONIC BASEBOARD THERMOSTATS ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of electronic baseboard thermostats that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%
- D. IF Q29C $\geq$ 0%: How many more months do you expect this follow-on effect of the program will last? _____

Q30.

- A. During the October-November promotion, the Power Down program provided a rebate of \$5 for each electronic baseboard thermostat sold in your store. If this rebate had not been available, do you think your October-November sales of electronic baseboard thermostats would be about the same, lower, or higher?
1. Same [SKIP TO Q31A]
 2. Lower
 3. Higher [SKIP TO Q31A]
 8. Refused [SKIP TO Q31A]
 9. Don't know [SKIP TO Q31A]
- B. [IF Q30A=2 (lower)]: By what percentage do you estimate your store's sales of these electronic baseboard thermostats would have been lower during the October-November promotion period if the \$5 Power Down program rebate had not been available?
RECORD PERCENTAGE _____%; [998=Refused; 999=Don't know/Not sure/Can't remember]
- C. I want to make sure I understand you correctly when you say your store's sales of electronic baseboard thermostats would be [% FROM Q30B] lower without the Power Down program rebate. So you're saying that if you sold 100 electronic baseboard thermostats in a given week with the program discounts, you would have only sold [100 - (% FROM Q30B * 100)] electronic baseboard thermostats that week without the program discounts?
IF RESPONSE IS $\neq$ YES THEN CLARIFY RESPONSE TO Q30B

Q31A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on electronic baseboard thermostats?

1. Yes
2. No
8. Refused
9. Don't know

Q31B. [IF Q31A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____

2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____
5. Other Federal Government \$ _____
6. Provincial Government \$ _____
7. City/Town/Municipality \$ _____
8. Other \$ _____
98. Refused
99. Don't know

Q32. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase electronic baseboard thermostats? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=7

ENERGY STAR REFRIGERATORS

Q33. I now have a few questions about your sales of refrigerators.

- A. Roughly what percent of ALL the refrigerators that your store sold between January and September 2010, BEFORE the Power Down program promotion, were ENERGY STAR refrigerators that were later rebated by the program?
- B. Now thinking of your sales of refrigerators DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the refrigerators that your store sold in were ENERGY STAR refrigerators that were rebated by the Power Down program?
- C. And roughly what percent of ALL the refrigerators that your store sold in December 2010, AFTER the program promotion period, were ENERGY STAR refrigerators that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the refrigerators that your store sold in October and November OF 2009 were ENERGY STAR refrigerators that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
REFRIGERATORS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q34. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED REFRIGERATORS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of ENERGY STAR refrigerators that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates?
_____ %
- B. [IF % SALES OF REBATED REFRIGERATORS ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of ENERGY STAR refrigerators that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? _____ %
- C. [IF % SALES OF REBATED REFRIGERATORS ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of ENERGY

STAR refrigerators that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q34C >= 0%: How many more months do you expect this follow-on effect of the program will last? ____

Q35.

- A. During the October-November promotion, the Power Down program provided a rebate of \$XXX for each ENERGY STAR refrigerator sold in your store. If this rebate had not been available, do you think your October-November sales of ENERGY STAR refrigerators would be about the same, lower, or higher?
1. Same [SKIP TO Q36A]
 2. Lower
 3. Higher [SKIP TO Q36A]
 8. Refused [SKIP TO Q36A]
 9. Don't know [SKIP TO Q36A]
- B. [IF Q35A=2 (lower)]: By what percentage do you estimate your store's sales of these ENERGY STAR refrigerators would have been lower during the October-November promotion period if the \$XXX Power Down program rebate had not been available?
RECORD PERCENTAGE ____%; [998=Refused; 999=Don't know/Not sure/Can't remember]
- C. I want to make sure I understand you correctly when you say your store's sales of ENERGY STAR refrigerators would be [% FROM Q35B] lower without the Power Down program rebate. So you're saying that if you sold 100 ENERGY STAR refrigerators in a given week with the program discounts, you would have only sold [100 - (% FROM Q35B * 100)] ENERGY STAR refrigerators that week without the program discounts?
IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q35B

Q36A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on refrigerators?

1. Yes
2. No
8. Refused
9. Don't know

Q36B. [IF Q36A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____

- 5. Other Federal Government \$ _____
- 6. Provincial Government \$ _____
- 7. City/Town/Municipality \$ _____
- 8. Other \$ _____
- 98. Refused
- 99. Don't know

Q37. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the ENERGY STAR refrigerators? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=8

ENERGY STAR CLOTHES WASHERS

Q38. I now have a few questions about your sales of clothes washers.

- A. Roughly what percent of ALL the clothes washers that your store sold between January and September 2010, BEFORE the Power Down program promotion, were ENERGY STAR clothes washers that were later rebated by the program?
- B. Now thinking of your sales of clothes washers DURING the Power Down promotion in October and November 2010, roughly what percent of ALL the clothes washers that your store sold in were ENERGY STAR clothes washers that were rebated by the Power Down program?
- C. And roughly what percent of ALL the clothes washers that your store sold in December 2010, AFTER the program promotion period, were ENERGY STAR clothes washers that had previously been rebated by the program?
- D. Finally, thinking back to your 2009 sales, roughly what percent of all the clothes washers that your store sold in October and November OF 2009 were ENERGY STAR clothes washers that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.	C.	D.
CLOTHES WASHERS	Jan-Sept. 2010	Oct-Nov 2010	Dec 2010	Oct-Nov 2009
Percent Rebated	%	%	%	%

Q39. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- A. [IF % SALES OF REBATED CLOTHES WASHER ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of ENERGY STAR clothes washer that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than between January and September 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November do you attribute to the Power Down program promotion and rebates? _____%
- B. [IF % SALES OF REBATED CLOTHES WASHER ARE HIGHER IN OCT-NOV 2010 (COL. B) THAN IN OCT-NOV. 2009 (COL D)]: You just indicated that the percentage sales of ENERGY STAR clothes washer that qualified for the Power Down rebate was higher during the Power Down program period in October-November 2010 than in October-November 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in October-November 2010 than in October-November 2009 do you attribute to the Power Down program promotion and rebates? _____%
- C. [IF % SALES OF REBATED CLOTHES WASHER ARE HIGHER IN DEC. 2010 (COL. C) THAN IN JAN-SEPT. 2010 (COL A)]: You just indicated that the percentage sales of ENERGY

STAR clothes washer that qualified for the Power Down rebate was higher after the Power Down program period in December 2010 than they were before Power Down program period, between January and September 2010. What percentage of that increase in sales do you attribute to the follow-on effects of the Power Down program promotion and rebates? _____%

- D. IF Q39C >= 0%: How many more months do you expect this follow-on effect of the program will last? ____

Q40.

- A. During the October-November promotion, the Power Down program provided a rebate of \$XXX for each ENERGY STAR clothes washer sold in your store. If this rebate had not been available, do you think your October-November sales of ENERGY STAR clothes washers would be about the same, lower, or higher?
1. Same [SKIP TO Q41A]
 2. Lower
 3. Higher [SKIP TO Q41A]
 8. Refused [SKIP TO Q41A]
 9. Don't know [SKIP TO Q41A]
- B. [IF Q40A=2 (lower)]: By what percentage do you estimate your store's sales of these ENERGY STAR clothes washers would have been lower during the October-November promotion period if the \$XXX Power Down program rebate had not been available?
RECORD PERCENTAGE ____%; [998=Refused; 999=Don't know/Not sure/Can't remember]
- C. I want to make sure I understand you correctly when you say your store's sales of ENERGY STAR clothes washers would be [% FROM Q40B] lower without the Power Down program rebate. So you're saying that if you sold 100 ENERGY STAR clothes washers in a given week with the program discounts, you would have only sold [100 - (% FROM Q40B * 100)] ENERGY STAR clothes washers that week without the program discounts?
IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q40B

Q41A. During the October-November promotion period, besides the Power Down program rebates, were there any other rebates provided on ENERGY STAR clothes washers?

1. Yes
2. No
8. Refused
9. Don't know

Q41B. [IF Q41A=YES]: Who offered the rebates and what was the value of the rebates?

1. Store \$ _____
2. Manufacturer1 (specify) \$ _____
3. Manufacturer2 (specify) \$ _____
4. Natural Resources Canada \$ _____

- 5. Other Federal Government \$ _____
- 6. Provincial Government \$ _____
- 7. City/Town/Municipality \$ _____
- 8. Other \$ _____
- 98. Refused
- 99. Don't know

Q42. During the October-November program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the ENERGY STAR clothes washers? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

Q43a. Thinking of your OVERALL experience with the Power Down program, how satisfied are you with the program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?

1. Very dissatisfied
2. Dissatisfied
3. Neither satisfied nor dissatisfied
4. Satisfied
5. Very Satisfied
8. (Refused)
9. (Don't know)

Q43b. IF Q43b = 1 or 2] You indicated that you were not satisfied with the Power Down program overall. What was the ONE most important reason you were not satisfied with the program overall? [PROBE FOR SPECIFIC ACCEPT ONE RESPONSE]

1. (Too much paperwork)
2. (Rebates were too small)
3. (Not enough items covered by program)
4. (Other) [SPECIFY _____]
5. (No other reasons)
98. Refused
99. Don't know

Q43c. Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

1. (Too much paperwork)
2. (Rebates were too small)
3. (Not enough items covered by program)
4. (Other) [SPECIFY _____]
5. (No other reasons)
98. Refused
99. Don't know

Q44. Now I'm going to ask you about your experience with specific aspects of the Power Down 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.

	VS	S	Neither	Dissat	V.Dissat	DK/Ref
a. Program marketing and advertising	5	4	3	2	1	9
b. Program support and communications	5	4	3	2	1	9
c. Items covered by program	5	4	3	2	1	9
d. Program rebates	5	4	3	2	1	9

Q44a1. [IF Q44a = 1 or 2] You indicated that you were not satisfied with the program marketing and advertising. Why were you not satisfied with the program marketing and advertising? [PROBE FOR SPECIFIC REASONS. MULTIPLE RESPONSES.]

Q44b1. [IF Q44b = 1 or 2] You indicated that you were not satisfied with the program support and communications. Why were you not satisfied with the program support and communications? [PROBE FOR SPECIFIC REASONS. MULTIPLE RESPONSES.]

Q44c1. [IF Q44c = 1 or 2] You indicated that you were not satisfied with the items covered by the program. Why were you not satisfied with the items covered by the program? [PROBE FOR SPECIFIC REASONS, E.G., WHAT OTHER ITEMS SHOULD HAVE BEEN COVERED. MULTIPLE RESPONSES.]

Q44d1. [IF Q44d = 1 or 2] You indicated that you were not satisfied with the program rebates. Why were you not satisfied with the program rebates? [PROBE FOR SPECIFIC REASONS, E.G., HOW COULD THE REBATES BE DIFFERENT. IF THEY NEED TO BE BIGGER, FOR WHICH ITEMS AND HOW MUCH SHOULD THE REBATE AMOUNT BE AND WHY. MULTIPLE RESPONSES.]

Q45a. Did you experience any barriers that limited your store's ability to participate in the Power Down Program?

Q45b. What were these barriers? [DO NOT READ; ACCEPT MULTIPLE RESPONSES]

Q46. Do you have any recommendations for improving the Power Down program?

Q47. Approximately how many full-time equivalent workers are employed at your store?

- 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

99 Don't know

22. How many years has your store been in business at this location? [RECORD #; -7 = Don't know]

[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK YOU FOR TAKING THE TIME TO RESPOND TO THIS SURVEY.]

INDEPENDENT RETAIL STORE MANAGER QUESTIONNAIRE NSPI RETAIL MARKDOWN PROGRAM: APPLIANCE REBATES

Final: January 6, 2011

Hello may I please speak with [INSERT CONTACT NAME OR ASK FOR STORE MANAGER]?

1 Yes [GOTO INTRODUCTION]

2 No [SAY "Perhaps you can help me anyway." GOTO INTRODUCTION]

INTRODUCTION

Hello, my name is _____, from NMR Group. I am calling on behalf of the Power Down Program from Nova Scotia Power.

I2. According to our records, your store has participated in the Power Down Program from Nova Scotia Power. NMR Group has been engaged by Nova Scotia Power to conduct an evaluation of this program. We have a few questions about your store's participation in this program. Specifically, I'd like to speak with someone in your store who is knowledgeable about the stocking and supplying of appliances that were rebated by the program. Would that be you?

[IF THEY WANT VERIFICATION OF THE LEGITIMACY OF THE RESEARCH, TELL THEM TO CALL [Name] OF NSPI AT [Phone number] OR [Name] OF NSPI AT [Phone number]]

I3. How familiar are you with the stocking patterns or sales trends for the appliances that you sell? Would you say you are:

- 6. Not at all familiar
- 7. Not familiar
- 8. Neither familiar nor unfamiliar
- 9. Somewhat familiar -[SKIP TO Q1]
- 10. Very familiar - [SKIP TO Q1]
- 9. Don't know / Refused

I4. Is there someone else at this store who would be familiar with the stocking patterns or sales trends for the appliances that you sell?

BACKGROUND

1. What is your job title?
 2. I am going to read you a list of types of products that were rebated through the Power Down program from Nova Scotia Power. Independent retailers such as yourself participated in this program program in November and December, 2010. For each product, please tell me:
 - (a) if the product was sold in your store at any time in 2010; and
 - (b) if the product received the Power Down program rebate at your store in November and December of 2010. (KEEP IN MIND THAT THE RETAILER MAY SAY THAT THE PROGRAM REBATES WERE APPLIED RETROACTIVELY TO SALES IN OCTOBER BECAUSE THE PROGRAM HAD STARTED IN OCTOBER FOR CHAIN RETAILERS. HOWEVER, WE ARE INTERESTED ONLY IN SALES DURING THE PERIOD IN WHICH THEY HAD JOINED THE PROGRAM.)
- (1=Yes, 2=No, 8=Refused, 9=Don't know)

		Q2a Sold it	Q2b Received rebate
APPLIANCES			
1	ENERGY STAR Refrigerators		
2	ENERGY STAR Clothes washers		

3. [If no for any of above] Why did your store not participate in the Power Down program for [PRODUCT TYPE]?
4. How did you first become aware of the Power Down program?
5. What was your initial reaction when you first heard about Power Down program? [If felt excluded] What actions, if any, did you take to become involved in the program?
6. Did you have any concerns about participating in the program?

- a. What was the ONE most important concern about participating in the program?
 - b. What was the SECOND most important concern about participating in the program?
7. Why did you decide to participate in the program? [Probe: increase sales, marketing benefits, help reduce energy usage, environmental concerns, etc.]
 - a. What was the ONE most important reason your store decided to participate in the program?
 - b. What was the SECOND most important reason your store decided to participate in the program?
8. Did you experience any barriers that limited your store's ability to participate in the Power Down Program? [Probe: if not already mentioned – not initially included in eligible stores; also probe for any barriers following expansion of program to include participating retailers.]
 - a. What were these barriers?
9. I'll ask you some specifics about sales in a few minutes but in general, what impact, if any, would you say the Power Down program had on sales of refrigerators and clothes washers at your store?
10. Did you change your stocking practices as a result of the Power Down program?
11. Did you change the placement or location of appliances in your store?
12. Did you make any changes to your advertising and promotions for these appliances? (PROBE: media advertising (flyers, newspaper ads, radio, tv), in-store signage, shelf talkers)

SALES SPECIFIC QUESTIONS

APPLIANCES

ENERGY STAR REFRIGERATORS

Q33. I now have a few questions about your sales of refrigerators.

- E. Roughly what percent of ALL the refrigerators that your store sold between January and October 2010, BEFORE you began participation in the Power Down program promotion, were ENERGY STAR refrigerators that were later rebated by the program?
- F. Now thinking of your sales of refrigerators DURING the Power Down promotion in November and December 2010, roughly what percent of ALL the refrigerators that your store sold in were ENERGY STAR refrigerators that were rebated by the Power Down program?
- G.
- H. Finally, thinking back to your 2009 sales, roughly what percent of all the refrigerators that your store sold in November and December OF 2009 were ENERGY STAR refrigerators that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.		D.

REFRIGERATORS	Jan-Sept. 2010	Oct-Dec 2010		Oct-Dec 2009
Percent Rebated	%	%		%

Q34. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- E. [IF % SALES OF REBATED REFRIGERATORS ARE HIGHER IN NOV-DEC 2010 (COL. B) THAN IN JAN-OCT. 2010 (COL. A)]: You just indicated that the percentage sales of ENERGY STAR refrigerators that qualified for the Power Down rebate was higher during the Power Down program period in November-December 2010 than between January and October 2010, when you were not participating in the Power Down program. What percentage of the higher sales in November-December do you attribute to the Power Down program promotion and rebates? _____%
- F. [IF % SALES OF REBATED REFRIGERATORS ARE HIGHER IN NOV-DEC 2010 (COL. B) THAN IN NOV-DEC. 2009 (COL. D)]: You just indicated that the percentage sales of ENERGY STAR refrigerators that qualified for the Power Down rebate was higher during the Power Down program period in November-December 2010 than in November-December 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in November-December 2010 than in November-December 2009 do you attribute to the Power Down program promotion and rebates? _____%

Q35.

- D. During the November-December promotion, the Power Down program provided a rebate of \$50 for each ENERGY STAR refrigerator sold in your store. If this rebate had not been available, do you think your November-December sales of ENERGY STAR refrigerators would be about the same, lower, or higher?
4. Same [SKIP TO Q36A]
 5. Lower
 6. Higher [SKIP TO Q36A]
 8. Refused [SKIP TO Q36A]
 9. Don't know [SKIP TO Q36A]
- E. [IF Q35A=2 (lower)]: By what percentage do you estimate your store's sales of these ENERGY STAR refrigerators would have been lower during the November-December promotion period if the \$50 Power Down program rebate had not been available?
RECORD PERCENTAGE ____%; [998=Refused; 999=Don't know/Not sure/Can't remember]
- F. I want to make sure I understand you correctly when you say your store's sales of ENERGY STAR refrigerators would be [% FROM Q35B] lower without the Power Down program rebate. So you're saying that if you sold 100 ENERGY STAR refrigerators in a given week with the program discounts, you would have only sold [100 - (% FROM Q35B * 100)] ENERGY STAR refrigerators that week without the program discounts?
IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q35B

Q36A. During the November-December promotion period, besides the Power Down program rebates, were there any other rebates provided on refrigerators?

- 3. Yes
- 4. No
- 8. Refused
- 9. Don't know

Q36B. [IF Q36A=YES]: Who offered the rebates and what was the value of the rebates?

- 9. Store \$ _____
- 10. Manufacturer1 (specify) \$ _____
- 11. Manufacturer2 (specify) \$ _____
- 12. Natural Resources Canada \$ _____
- 13. Other Federal Government \$ _____
- 14. Provincial Government \$ _____
- 15. City/Town/Municipality \$ _____
- 16. Other \$ _____
- 98. Refused
- 99. Don't know

Q37. During the November-December program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the ENERGY STAR refrigerators? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

IF Q2B1=8

ENERGY STAR CLOTHES WASHERS

Q38. I now have a few questions about your sales of clothes washers.

- E. Roughly what percent of ALL the clothes washers that your store sold between January and October 2010, BEFORE you began participation in the Power Down program promotion, were ENERGY STAR clothes washers that were later rebated by the program?
- F. Now thinking of your sales of clothes washers DURING the Power Down promotion from November and December 2010, roughly what percent of ALL the clothes washers that your store sold in were ENERGY STAR clothes washers that were rebated by the Power Down program?
- G.
- H. Finally, thinking back to your 2009 sales, roughly what percent of all the clothes washers that your store sold from November and December OF 2009 were ENERGY STAR clothes washers that were later rebated by the Power Down program?

[IF RESPONDENT DOES NOT KNOW, ASK THEM FOR THEIR BEST GUESS. IF THEY CANNOT PROVIDE A SINGLE BEST GUESS, ASK THEM FOR AN APPROXIMATE RANGE. TRY, AS FAR AS REASONABLY POSSIBLE, TO AVOID A DON'T KNOW RESPONSE]

	A.	B.		D.
CLOTHES WASHERS	Jan-Sept. 2010	Oct-Dec 2010		Oct-Dec 2009
Percent Rebated	%	%		%

Q39. [RECORD PERCENTAGE ____%; 998=Refused; 999=Don't know/Not sure/Can't remember]

- E. [IF % SALES OF REBATED CLOTHES WASHER ARE HIGHER IN NOV-DEC 2010 (COL. B) THAN IN JAN-OCT. 2010 (COL A)]: You just indicated that the percentage sales of ENERGY STAR clothes washer that qualified for the Power Down rebate was higher during the Power Down program period in November-December 2010 than between January and October 2010, when they were not eligible for the Power Down rebate. What percentage of the higher sales in November -December do you attribute to the Power Down program promotion and rebates? _____%
- F. [IF % SALES OF REBATED CLOTHES WASHER ARE HIGHER IN NOV-DEC 2010 (COL. B) THAN IN NOV-DEC. 2009 (COL D)]: You just indicated that the percentage sales of ENERGY STAR clothes washer that qualified for the Power Down rebate was higher during the Power Down program period in November-December 2010 than in November-December 2009, when they were not eligible for the Power Down rebate. What percentage of the higher sales in November -December 2010 than in November -December 2009 do you attribute to the Power Down program promotion and rebates? _____%
- G.

Q40.

- D. During the November-December promotion, the Power Down program provided a rebate of \$50 for each ENERGY STAR clothes washer sold in your store. If this rebate had not been available, do you think your November-December sales of ENERGY STAR clothes washers would be about the same, lower, or higher?

- 4. Same [SKIP TO Q41A]
- 5. Lower
- 6. Higher [SKIP TO Q41A]
- 8. Refused [SKIP TO Q41A]
- 9. Don't know [SKIP TO Q41A]

- E. [IF Q40A=2 (lower)]: By what percentage do you estimate your store's sales of these ENERGY STAR clothes washers would have been lower during the November-December promotion period if the \$50 Power Down program rebate had not been available?

RECORD PERCENTAGE ____%; [998=Refused; 999=Don't know/Not sure/Can't remember]

- F. I want to make sure I understand you correctly when you say your store's sales of ENERGY STAR clothes washers would be [% FROM Q40B] lower without the Power Down program rebate. So you're saying that if you sold 100 ENERGY STAR clothes washers in a given week with the program discounts, you would have only sold [100 - (% FROM Q40B * 100)] ENERGY STAR clothes washers that week without the program discounts?

IF RESPONSE IS ≠ YES THEN CLARIFY RESPONSE TO Q40B

Q41A. During the November-December promotion period, besides the Power Down program rebates, were there any other rebates provided on ENERGY STAR clothes washers?

- 3. Yes
- 4. No
- 8. Refused
- 9. Don't know

Q41B. [IF Q41A=YES]: Who offered the rebates and what was the value of the rebates?

- 9. Store \$ _____
- 10. Manufacturer1 (specify) \$ _____
- 11. Manufacturer2 (specify) \$ _____
- 12. Natural Resources Canada \$ _____
- 13. Other Federal Government \$ _____
- 14. Provincial Government \$ _____
- 15. City/Town/Municipality \$ _____
- 16. Other \$ _____
- 98. Refused
- 99. Don't know

Q42. During the November-December program promotion period, how important would you say the rebate from the Power Down Program was to customers' decisions to purchase the ENERGY STAR clothes washers? Please give your response on a scale of 1 to 5 where 1 is not at all important and 5 is extremely important.

MARKETING – INCENTIVE/REBATE PROCESSING

13. Did you market the Power Down program or the available rebates in any way? [Probe: flyers, newspaper ads, radio, tv, circulars, posters, in-store signage, shelf-talkers, direct mail, etc.]
 - a. Why or why not?
14. During the past year that is between January and October 2010, BEFORE you began participation in the Power Down program promotion, did your stores utilize any advertising to specifically promote the ENERGY STAR refrigerator or clothes washer models that later qualified for the Power Down program?
 - a. Which media did your store use to promote ENERGY STAR refrigerators and clothes washers that qualified for the Power Down program rebates?
 - b. How often, on average, did your store run some kind of media advertisement to specifically promote these appliances?
15. Did your stores utilize any advertising to specifically promote ENERGY STAR refrigerators or clothes washers that qualified for the Power Down program between November and December 2009 [last year]?
 - a. Which media did your store use to promote ENERGY STAR refrigerators and clothes washers that qualified for the Power Down program?
 - b. How often, on average, did your store run some kind of media advertisement to specifically promote these appliances?
16. Please describe for me how you presented the rebate/incentive to customers? For example, did you markdown the prices for appliances so customers saw the price after the rebate? Or did you display the rebate next to the full price? Did you apply the rebate/incentive at time of sale or did the customer need to fill-out a form to receive the rebate after the purchase?

Now, I'd like to ask you a few questions about how you processed and tracked the rebates/incentives as part of the program.

17. How did you track the rebates/incentives? [Excel spreadsheet, paper/by hand, etc.] Did the implementation contractor or NSPI provide you with any forms or tracking sheets?
18. What did you submit to the implementation contractor or NSPI to invoice/collect the rebates/incentives?
 - a. How often did you submit paperwork for rebates/incentives? [How often did you invoice?]
 - b. How long did it take to receive the rebates/incentives from the implementation contractor or NSPI?

SATISFACTION

19. Thinking of your OVERALL experience with the Power Down program, how satisfied are you with the program? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?
- a. [If dissatisfied] What was the ONE most important reason you were not satisfied with the program overall? Were there any other reasons you were dissatisfied?
20. Now I'm going to ask you about your experience with specific aspects of the Power Down program. Again, 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.

	VS	S	Neither	Dissat	V.Dissat	DK/Ref
a. Program marketing and advertising	5	4	3	2	1	9
b. Program support and communications	5	4	3	2	1	9
c. Interaction with the implementation contractor	5	4	3	2	1	9
d. Interaction with NSPI Staff	5	4	3	2	1	9
d. Items covered by program	5	4	3	2	1	9
e. Program rebates	5	4	3	2	1	9
f. Rebate processing	5	4	3	2	1	9
g. Tracking and reporting of rebates	5	4	3	2	1	9

21. [For anything rated 1 or 2] You indicated that you were not satisfied with [item]. Why were you not satisfied with [item]?

RECOMMENDATIONS FOR IMPROVEMENTS — FIRMOGRAPHICS

22. What ONE aspect of the program do you think had the greatest impact on sales? What other aspects of the program do you think had an impact on the sales?
23. Were there any barriers or challenges that may have affected customer participation in the program?
24. What was the ONE most important barrier affecting customer participation? Any others?
25. Do you have any recommendations for improving the Power Down program?

26. Approximately how many full-time equivalent workers are employed at your store?

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

99 on't know

27. How many years has your store been in business at this location? [RECORD #; -7 = Don't know]



Impact and Process Evaluation: Efficient Products Appliance Retirement and Replacement Programs 2010

February 25, 2011

Final Report

Submitted to:

Efficiency Nova Scotia Corporation

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1 Executive Summary

This report presents the results of the 2010 process and impact evaluation of the Efficient Products Appliance Retirement and Replacement program (ARR) conducted by NMR Group, Inc. NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

Impact Evaluation Findings

The impact evaluation draws upon a review of program records, telephone survey data, data from the Association of Home Appliance Manufacturers (AHAM), and key values from other studies to produce program impacts. The participant telephone surveys were used to estimate free-ridership values based on self-reported statements regarding actions in the absence of the program. The generator-level energy and demand savings estimates can be found in Table 1. For the 2010 program year, the generator-level impacts were estimated at 2,286 MWh of energy savings and 476.4 kW of demand savings.¹

Table 1: 2010 Program Energy and Demand Savings

	Gross Savings at Generator		Net-to-Gross Ratio (%)	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
Appliance Retirement					
Primary refrigerators—replaced	177.9	853.9	60%	106.7	512.3
Secondary refrigerators—replaced	69.1	331.5	83%	57.4	275.1
Secondary refrigerators—not replaced	159.0	763.2	73%	116.1	557.1
Secondary freezers—replaced	81.6	391.6	73%	59.6	285.9
Secondary freezers—not replaced	103.2	495.2	93%	96.0	460.5
Dehumidifiers	17.8	85.3	53%	9.4	45.2
Appliance Replacement					
Refrigerators	31.2	149.8	100%	31.2	149.8
Total Program	639.8	3,070.5		476.4	2,285.9

¹ NMR conducted one in-depth interview with a participant from the Appliance Replacement program component. NMR determined that it was not appropriate to project the free ridership estimate from this interview to all program participants. For this reason, free ridership estimates were not calculated for the Appliance Replacement program component.

	Gross Savings at Generator		Net-to-Gross Ratio (%)	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
Appliance Retirement					
Primary refrigerators—replaced	177.9	853.9	60%	106.7	512.3
Secondary refrigerators—replaced	69.1	331.5	83%	57.4	275.1
Secondary refrigerators—not replaced	159.0	763.2	73%	116.1	557.1
Secondary freezers—replaced	81.6	391.6	73%	59.6	285.9
Secondary freezers—not replaced	103.2	495.2	93%	96.0	460.5
Dehumidifiers	17.8	85.3	53%	9.4	45.2
Appliance Replacement					
Refrigerators	31.2	149.8	100%	31.2	149.8
Total Program	639.8	3,070.5	74%	476.4	2,285.9

Findings and Recommendations

The process evaluation drew upon in-depth interviews conducted with program staff, contractors, and participants; as well as a survey of program participants.

Appliance Retirement

There clearly is substantial demand for an Appliance Retirement Program in Nova Scotia. This was reflected in the fact that, in spite of relatively high free ridership levels, the program was able to achieve its savings goals. Additionally, responding to public demand, the DSM Administrator felt it necessary to extend the program into a second phase. The design of any future program needs to be sure to address a number of issues including screening out free riders, developing rational incentive structures, timing of promotions, and careful attention to planning and communications. Detailed findings and recommendations are provided below.

Findings and Recommendations

Finding	Recommendation
ARR-F1. Around four out of five respondents who retired each appliance type (76% for refrigerators; 79% for freezers; and 80% for dehumidifiers) reported that the appliance picked up by the program was plugged in all or most of the time in the year before it was picked up. Also, in spite of high free ridership levels, the program was able to achieve its savings goals.	ARR-R1. Appliances picked up by any future program have the potential to offer significant energy savings. The DSM Administrator should consider expanding the pilot to a full-scale program.
ARR-F2. The Appliance Retirement Program had high free ridership (66%). One contractor suggested that in an effort to decrease free ridership, the call center make it clear that only appliances that are currently plugged in, working, and are used regularly be allowed to be eligible for the program.	ARR-R2. Any future program should reinforce screening efforts at the participant registration stage to screen out potential free riders.
ARR-F3. The Appliance Retirement Program tracking database assumed that all dehumidifiers were replaced, but none of the refrigerators and/or freezers were replaced. Approximately one-half of the respondents who removed a refrigerator (56%) or freezer (50%) and three-quarters of those who removed a dehumidifier (73%), replaced the appliance with another appliance of the same type after it was picked up by the program.	ARR-R3. Appliances that are replaced do not save as much energy as appliances that are retired. The DSM Administrator should consider the implications of appliance replacements when considering the costs and benefits of the appliance retirement program. The impact evaluation for 2010 reflects these differences.

Findings and Recommendations

Finding	Recommendation
ARR-F4. The appeal of the Appliance Retirement Program lies in the ease with which customers can enroll as well as the relative uniqueness of its offering. Respondents reported that they found it relatively easy to enroll in the program, whether they enrolled by phone or online. A program contractor also observed that customers have only limited opportunities to have their appliances picked up and recycled outside of the Appliance Retirement Program and the other options require that customers pay a fee.	ARR-R4. Any future program design should seek to replicate these program elements that were important facets of the appeal of the pilot.
ARR-F5. While participant motivations to dispose of their appliances through the program varied. The program's offer to pick up the appliance appeared to be the primary motivation for those who retired refrigerators and freezers. In contrast, the primary motivation for those who retired dehumidifiers appeared to be the desire to save on energy use or costs. However, it is important to note that the program incentive also was an important motivation cited particularly by those who retired freezers and dehumidifiers.	ARR-R5. Any future program design should consider the motivations of customers. The combination of ease of participation and pickup services with an incentive provided a strong motivation for customers to participate in the program.
ARR-F6. The single most influential factor influencing customers' decision to participate in the program was the removal and recycling services provided for free as part of the program. Incentives tended to receive lower influence ratings. Furthermore, one of the program contractors thought that it may not be possible to justify the cost of picking up smaller appliances such as dehumidifiers.	ARR-R6. Any future program design should consider reducing the incentive amounts offered for appliances. The incentive structure should also factor in the relative costs and benefits of picking smaller appliances, possibly bundling pickups only with larger appliances.
ARR-F7. Respondents with a secondary refrigerator or a freezer were asked how important it was to have a spare refrigerator or freezer for storing food and beverages. A majority of respondents (65%) who removed a spare refrigerator thought it was not necessary; while a majority of respondents (56%) who removed a freezer thought it was necessary. In addition, the vast majority of respondents (91%) said they had experienced no drawbacks after having disposed of their appliance.	ARR-R7. When developing its incentive structure, any future program design should also factor in the variation in importance of different secondary appliances to customers.

Findings and Recommendations

Finding	Recommendation
ARR-F8. According to one program contractor, the peak season for appliance purchases is in the fall.	ARR-R8. Promotions of any future program may want to coincide with peak appliance purchasing periods. In addition, the program should be sure to coordinate with any future appliance rebate programs that the DSM Administrator may implement.
ARR-F9. Two-thirds of respondents learned about the Appliance Retirement Program through some form of program advertising and one in five respondents said they heard about the program through word-of-mouth.	ARR-R9. Program participation appears to be driven primarily by marketing and advertising. While word-of-mouth was a significant source of awareness, marketing and advertising efforts appear to have been the major driving force behind program awareness. Should the DSM Administrator choose to implement a future appliance retirement program over a longer period, they should consider staging marketing and advertising in waves to allow for sufficient marketing over the entire program period as well as allowing time for word-of-mouth to stimulate participation.
ARR-F10. By design, pilot programs typically are set up to operate for a limited time period and often in a limited geographical area. This allows program administrators to experiment with new programs that may prove to be infeasible due to program administration, costs, or consumer interest. A limited time period also allows program staff to evaluate pilot results quickly and assess the potential opportunity for the programs. However, these constraints can also serve as barriers to program performance in the short-term.	ARR-R10. When assessing the potential for any future program, the DSM Administrator should keep in mind that some of the obstacles and issues encountered in the pilot might have been avoided had the program been set up to operate over a longer time period.
ARR-F11. According to program staff and contractors, the Appliance Retirement Program did not allow for much lead time to plan and prepare for program implementation. While the program was able to overcome this obstacle and successfully launch on schedule, the short lead time made it difficult for subcontractor to properly prepare for program implementation.	ARR-R11. Any future program should consider providing enough notice to subcontractors so they can secure staff and resources to most effectively perform their role.

Findings and Recommendations

Finding	Recommendation
ARR-F12. The Appliance Retirement Program included a number of organizations that had to work together to deliver the program. Internal communications amongst so many organizations can be difficult and it is perhaps not surprising that some of the organizations involved reported communication problems. Perhaps typifying the communications issues, the most notable oversight occurred when the DSM Administrator decided to extend the program into a second phase. Two of the program's contractors indicated that they learned about the program extension only after it was announced on television. Furthermore, the outsourced call center for the second phase was not fully - prepared due to time constraints and the level of marketing and outreach also was significantly reduced for the second phase. These factors combined contribute to lower participation levels in the second phase of the program.	ARR-R12. Close planning and coordination, and clear lines of internal communications between the multiple organizations will be critical to the success of any future program. The DSM Administrator should include all involved organizations early on in the planning stage and develop internal communications protocols to ensure that all of them are on the same page. Communications protocols could include regular emails shared with all stakeholders and regularly scheduled teleconferences.

Appliance Replacement

The Appliance Replacement Program component was the DSM Administrator's first foray into the multi-family market. The multi-family market is widely considered to be "hard-to-reach" and this was reflected in the pilot program's experience in Nova Scotia. At the time of the in-depth interviews with program staff, the program had been unsuccessful in soliciting a single participant and the pilot program had to be extended by a month in order to achieve any results at all in 2010.² The difficulty in reaching the multi-family market may have been compounded by the fact that, as a pilot program, the resources of the appliance replacement program were necessarily limited. The program restricted its marketing and outreach activities to cold calls and meetings with a few property managers. In addition, the limited term of the pilot program made it difficult to synchronize with the longer planning cycle of the multi-family sector, which typically operates on set annual budgets with predetermined allowances for planned replacements of equipment such as refrigerators.

Despite the difficulties involved with working with the multi-family sector, this is a market that offers substantial energy savings opportunities. NMR recommends that the DSM Administrator continue to move forward with the Appliance Replacement Program and use it as an opportunity to gain a foothold in the multi-family sector. As the program establishes itself, it will provide opportunities to deepen

² NMR also encountered similar difficulties in attempting to complete in-depth interviews with program participants. At the time NMR started contacting participants, the program had had only seven participants who had replaced a total of 291 refrigerators. NMR sought to interview as many of these participants as possible but was able to complete an interview with only one participant who had replaced a total of 24 refrigerators. Because the appliance replacement program was slow to gain traction in the market and because of the difficulty in contacting program participants, the process evaluation relied on the results of in-depth interviews with program staff, contractors, and one program participant.

relationships with multi-family landlords, property owners and managers which, in turn, can provide an opening for other future programs that may focus on the multi-family sector. Pursuant to developing program offerings for the multi-family sector, the DSM Administrator should seek to gain a better understanding of this market in Nova Scotia. In particular, the DSM Administrator should keep in mind that splint incentives can be a significant barrier to energy efficiency improvements in the multi-family sector.

In order to aid the DSM Administrator in the pursuit of opportunities in the multi-family sector, NMR provides the following recommendations. While these recommendations draw upon the evaluation of the Appliance Replacement Program, they also encompass NMR's experience in the multi-family sector from evaluations as well as program planning activities in other jurisdictions.

Findings and Recommendations

Finding	Recommendation
ARR-F13. The appliance replacement participant interviewed said that she targeted for replacement those refrigerators that were in the worst condition. According to this participant, most of the refrigerators replaced were around 20 years old. When asked why she decided to replace the refrigerators, her reasons varied based on who was responsible for the electric bills. In units where the tenants were responsible for the electric bill, she replaced the refrigerators because they were near the end of their useful lives. In units where the tenants were not responsible for the electric bill, she replaced the refrigerators to take advantage of cost savings from lower utility bills. In addition, she said that the rebate, the discounted price of refrigerators, and the removal and recycling services, all were very influential in her decision to participate in the program.	ARR-R13. The combination of removal services and incentives offered by the program worked together to motivate customers to participate in the program. In any future program, the DSM Administrator should continue to bundle incentives together with services (such as removal services) that make for a compelling value proposition for participants.

Findings and Recommendations

Finding	Recommendation
ARR-F14. The appliance replacement participant identified two areas of dissatisfaction with the program—both relating to payment for the refrigerators. (i) She was unaware that she would be unable to use a credit card to pay for the refrigerators. (ii) She also was dissatisfied that it took over two months for the program to provide her with her rebate.	ARR-R14. Any future program should make sure that participants can pay for refrigerators by their preferred method. In addition, the program should seek to reimburse participants in a timely fashion. Additionally, the program may want to consider allowing participants to pay only for the portion of the refrigerators not covered by program incentives. Instead of reimbursing the participant for the rebate amount, the program could work with their appliance vendor so that participants purchase refrigerators at a discount and the rebates are remitted to the appliance vendor.
ARR-F15. Due to the status of the Appliance Replacement Program as a pilot, it had a limited target for the number of refrigerators to be replaced. Program promotions consisted solely of cold calls to potential participants and meetings with a few property owners. Thus the pilot program did not have an opportunity to fully engage with and assess the potential opportunities in the multi-family sector.	ARR-R15. Any future program should explore the following potential opportunities in the multi-family sector: • Affordable housing property owners. This may be one the easiest markets to reach in the multi-family sector. Energy costs are a significant portion of their clients' housing costs and they see it is as part of their core mission to ensure that their properties are energy efficient. • Bundle incentives. Evaluate bundling incentives by requiring participants to retire and replace multiple appliances to receive the incentives, or providing higher incentives for multiple appliances.
ARR-F16. When targeting the multi-family market, split incentives are often the most common barrier encountered.	ARR-R16. To mitigate the split incentives barrier, the program should seek to educate multi-family landlords on the non-energy benefits of improving the energy efficiency of the properties such as increased tenant comfort, higher tenant satisfaction, and reduced tenant turnover.

2 Program Description and Data Tracking

2.1 Program Description

The 2010 Appliance Retirement and Replacement program (ARR) was a pilot program offered to customers in the regional municipalities of Halifax and Cape Breton in the second half of 2010.

The Appliance Retirement program component picked up old refrigerators, freezers and dehumidifiers from single family households in Nova Scotia. In addition to picking up these appliances for free, the program offered customer incentives of \$35 for each refrigerator or freezers and \$10 for each dehumidifier that was retired. Initially, the Appliance Retirement program ran from June through September 2010. Owing to the strong response to the program, it was extended to a second phase in October and November 2010.

The Appliance Replacement program component was offered to multi-residential buildings in Nova Scotia. The program provided new energy efficient refrigerators at a discounted price and picked up and recycled the old refrigerators. In addition, the program offered rebates of \$100 to \$200 for the new refrigerators. This program ran from June through December 2010.

The ARR program, also known as the “Pull the Plug” program, was implemented by the implementation contractor, who contracted with a number of other organizations to help deliver the program. These included:

- **Subcontractor.** Managed the Appliance Replacement program component. The subcontractor also hosted the call center in the first phase of the Appliance Retirement program component where it managed incoming calls, scheduled pickups, and handled customer service and pickup issues.
- **Outsourced call center.** Hosted the call center in the second phase of the Appliance Retirement program component.
- **Recycler.** Recycled all of the old appliances.
- **Pick-up service (Recycler).** Worked with the Appliance Retirement program component to pick up the old appliances from single family homes in Nova Scotia and transport them to the recycler.
- **Retailer.** Worked with the Appliance Replacement program component to provide energy efficient refrigerators at a discounted price to multi-residential buildings, installed the new refrigerators and collected the old refrigerators for eventual pick up by the recycler.

2.2 Program Background

The ARR program is primarily a recycling and education program. The program was designed to meet several specific goals. The first was to promote behavior change in the Halifax Regional Municipality and Cape Breton areas by encouraging the use of more efficient appliances and removing the old ones from the grid. The program supported energy efficient education through two distinct components: retirement of inefficient secondary refrigerators, freezers and dehumidifiers from single-family dwellings, and replacement of inefficient refrigerators from multi-residential buildings. By removing the old appliances, the program created significant electricity savings as well as environmental benefits from recycled materials and the proper disposal of appliance waste. Additionally, the replacement program component generated energy savings as a result of the installation of energy efficient refrigerators. The campaign design phase ran from March 2010 to May 2010, when a chain of custody for surrendered units was established, local recycler and shipping companies were identified, incentive levels were determined, and a marketing communication plan was developed. The program was implemented between June and November 2010.

2.2.1 Appliance Retirement Program Theory

The Appliance Retirement program component was a pilot with primarily a Resource Acquisition objective of removing inefficient appliances from the grid. A full program would also have a Market Transformation objective of shifting market attitudes and behaviors regarding the use of inefficient appliances and recycling practices.

Program Activities

- **Recruitment and training of drivers.** Drivers are recruited and trained to pick up appliances.
- **Marketing and outreach.** The program is promoted and marketed through direct mail and radio advertising.
- **Call center.** Fields calls, schedules appliance pick-ups, and monitors the data collection while performing quality assurance follow-up calls.
- **Delivery company picks up old appliances and sends to recycler.** Drivers go to customers home and plug in appliances to check if they work. Regardless of whether or not they are working, the appliances are picked up and delivered to the recycler.
- **Rebate processing.** Program implementer determines the incentive level and disburses rebates for the surrendered units recycled. Rebates are provided only for appliances that were determined by the pickup drivers to be working appliances.

Program Assumptions

- **Sufficient marketing and outreach.** Marketing and outreach activities are sufficient to recruit adequate numbers of participants.
- **Sufficient program delivery staff.** The program hires companies with sufficient numbers of people to effectively satisfy demand and pickup and recycle the appliances.
- **Skills and equipment.** Program delivery companies and staff have the equipment, tools, and skills required to remove and recycle surrendered appliances.
- **Transfer of understanding.** Single-family homes will remember the energy and bill savings they realized from participating in the program and consider energy efficient options when making decisions to purchase energy using equipment.

Program Barriers

- **Second refrigerators or freezers are being used.** Some customers may not want to get rid of their refrigerators or freezers because they are continuing to use them or want to keep them in case they may need them.
- **Inadequate staff.** Companies and their staff hired to deliver the program may not have the capacity or expertise to perform stated program activities.
- **Inaccessibility.** Some homes or the appliances in some homes may be inaccessible to program pickup drivers.

Short-Term Outcomes

- **Customers learn of the program.** Customers are made aware of the program through the marketing and outreach campaign, specifically direct mail, in store signage, radio, Internet, community newspapers, and retail store flyers.
- **Customers contact program and request pick-up.** After becoming aware of the service offered by the program, customers call to schedule a pickup of qualifying appliances.
- **Old appliances removed and fewer inefficient appliances in the market.** Energy savings are achieved when old appliances are removed from the home and fewer inefficient products are in the market.
- **Old appliances recycled.** Most of the materials in the old appliances are recycled.

Mid-Term Outcomes

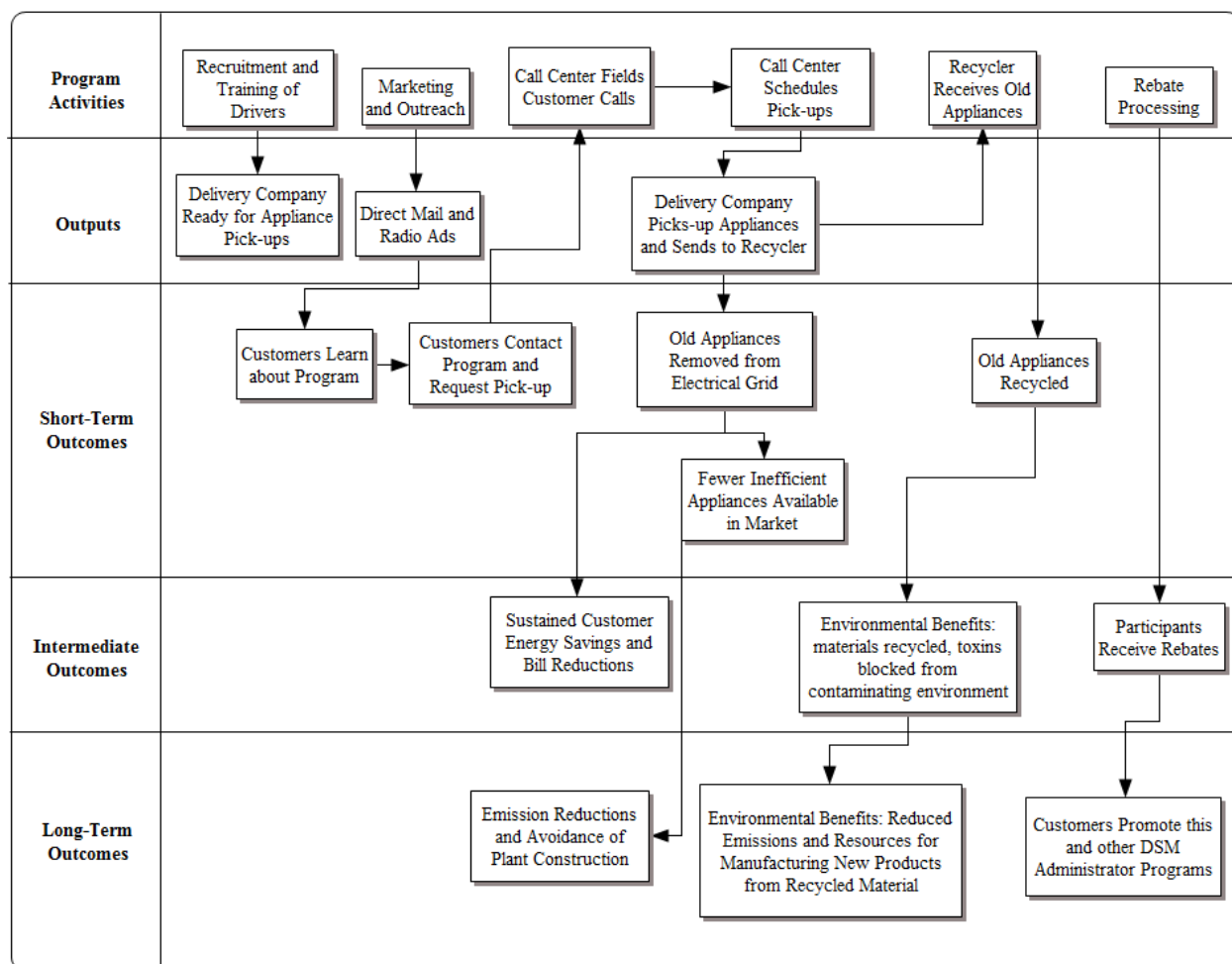
- **Sustained customer energy savings and bill reductions.** Customers derive sustained energy savings and bill reductions as a result of discontinuing use of the surrendered appliances.
- **Environmental benefits.** Surrendered appliances are recycled instead of land-filled while toxins are blocked from entering the environment.
- **Participants receive incentives.** Participants receive incentives for surrendering appliances to be recycled.

Long-Term Outcomes

- **Customers promote this and other DSM administrator programs.** Due to first-hand experience in an appliance retirement program, participants become aware of and interested in other energy efficient measures and seek to participate in other energy efficiency programs.
- **Environmental benefits: Emissions reductions and avoidance of new generation.** Energy savings translate into a reduction in emissions while demand and energy savings reduce the need for new plant construction. The manufacture of new products from recycled material promotes a reduction in new resource use.

2.2.2 Appliance Retirement Program Logic Model

Figure 2-1: Appliance Retirement Program Logic Model



2.2.3 Appliance Replacement Program Theory

The Appliance Replacement program component was a pilot with primarily a Resource Acquisition objective of removing inefficient refrigerators from the grid and replacing them with energy efficient refrigerators. A full program would also have a Market Transformation objective of shifting market attitudes and behaviors of building owners and managers regarding the use of inefficient refrigerators and recycling practices.

Program Activities

- **Contract with vendor to provide energy efficient refrigerators.** A vendor is contracted to sell energy efficient refrigerators at a discounted price, install the new refrigerators, and remove the old inefficient refrigerators.
- **Marketing and outreach.** The program is marketed through direct communications with decision makers at the management of multi-residential building.
- **Refrigerator vendor receives information and issues invoice to customer.** After a program representative visits the customer buildings and determines the number of refrigerators to be replaced, the refrigerator vendor issues an invoice to the customer.
- **Refrigerator vendor schedules delivery and pick up.** Once the refrigerator vendor receives payment for the new refrigerators, installation is arranged with multi-residential building landlord/manager to put in the new refrigerators and remove the old ones.
- **Old appliances are recycled.** Old appliances are sent to a recycler for appropriate disposal.
- **Rebate processing.** The program sends customers their rebate for each refrigerator they retired and replaced.

Program Assumptions

- **Telephone outreach.** The telephone calls made by trained representatives directly to landlords/building management are sufficient generate interest for the program.
- **Prospective customers have available budget.** The prospective customers have the budget available to purchase multiple refrigerators through the program.
- **Vendor has sufficient stock of refrigerators.** The refrigerator vendor maintains a sufficient stock of energy efficient refrigerators.
- **Sufficient pickup and delivery staff.** The refrigerator vendor has sufficient pickup and delivery staff to deliver and install the new refrigerators, and pickup the old refrigerators.
- **Skills and equipment.** The refrigerator vendor staff has the equipment, tools, and skills required to install the new refrigerators and pickup the old refrigerators.

- **Transfer of understanding.** Multi-residential unit owners will remember the energy and bill savings they realized from participating in the program and consider energy efficient options when making decisions to purchase other energy using equipment in the future.

Program Barriers

- **Program timing.** The program may be contacting customers after they have already established their budget for the year and there may be no available funds in their budget for replacing refrigerators.
- **Inadequate staff.** Companies and their staff hired to deliver the program may not have the capacity or expertise to perform stated program activities.

Short-Term Outcomes

- **Customers agree to participate in the program.** Customers are contacted by program representatives and agree to purchase new energy efficient refrigerators through the program.
- **Program representative visits customer's building and counts refrigerators to be replaced.** The program schedules and sends a representative to visit the customer's building and count the number of refrigerators to be replaced.
- **Customer pays vendor invoice for new refrigerators.** Customer pays the refrigerator vendor for the new units.
- **Old appliances removed and fewer inefficient appliances in the market.** Energy savings are achieved when old appliances are removed from the home and fewer inefficient products are in the market.
- **Old appliances recycled.** Most of the materials in the old appliances are recycled.

Mid-Term Outcomes

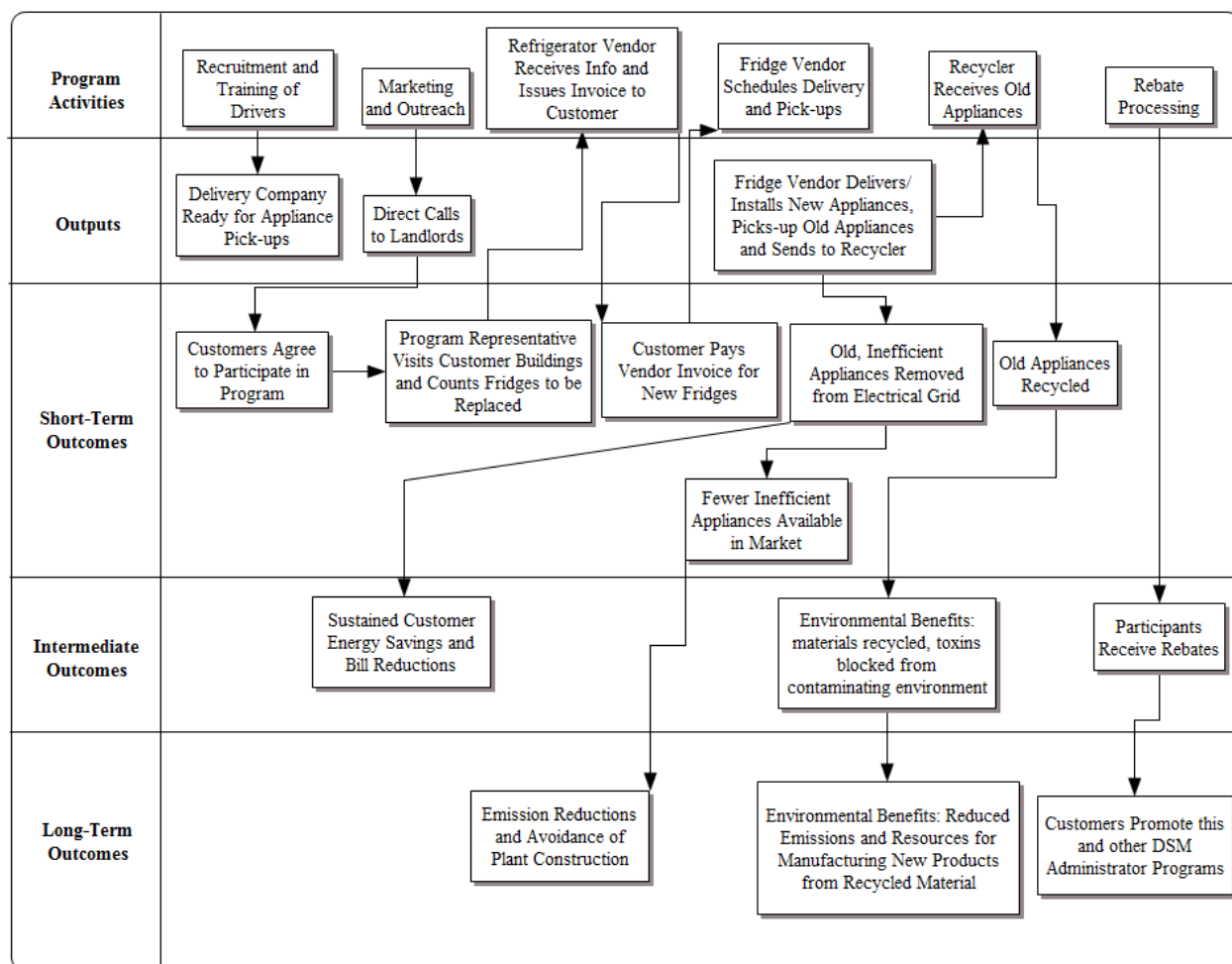
- **Sustained customer energy savings and bill reductions.** Multi-residential building owners gain first-hand understanding about the benefits of purchasing energy efficient equipment leading to sustained energy savings and a reduction in energy costs.
- **Environmental benefits.** Removed appliances are recycled instead of land-filled while toxins are blocked from entering the environment.
- **Participants receive rebates.** Participants receive rebates for retiring old, inefficient refrigerators and purchasing new, energy efficient refrigerators.

Long-Term Outcomes

- **Customers promote this and other DSM administrator programs.** Due to first-hand experience in an appliance replacement program, participants become aware of and interested in other energy efficient measures and seek to participate in other energy efficiency programs.
- **Environmental benefits: Emissions reductions and avoidance new generation.** Energy savings translate into a reduction in emissions while demand and energy savings reduce the need for new plant construction. The manufacture of new products from recycled material promotes a reduction in new resource use.

2.2.4 Appliance Replacement Program Logic Model

Figure 2-2: Appliance Replacement Program Logic Model



3 Impact Evaluation

3.1 Methodology for Refrigerators and Freezers

This section describes the methodology and calculations used by NMR to calculate the savings for refrigerators and freezers in the Appliance Retirement and Replacement program.

The NMR team used shipment weighted data from the Association of Home Appliance Manufacturers (AHAM) to develop an average unit energy consumption value (UEC) for the refrigerators and freezers that were retired through the program.^{[3][4][5]} AHAM provides annual energy consumption estimates for a number of appliances based on year of manufacture. We applied an AHAM estimate to each of the refrigerators and freezers that were retired through the program, and adjusted those values to reflect two things:

- 1) The degradation of refrigerators and freezers over time.
- 2) The adjustment of lab based consumption estimates to the actual consumption of refrigerators and freezers “in the field”.

The equation used to develop UEC estimates is presented below:

$$UEC = \left[\frac{\sum_{i=1}^n [(AHAM_i) + (kWh\ degradation_i)]}{n} \right] \times \left(\frac{Site}{Lab} Factor \right)$$

Where:

- AHAM_i: Per unit AHAM annual energy consumption
- *kWh degradation_i* = *Unit age_i* × *Performance degradation factor*⁶
- n: Number of units recycled through the program
- Site/Lab Factor: Adjustment for DOE to *in situ* performance⁷

After developing UEC estimates, we accounted for partial use and replacement equipment to calculate adjusted gross savings. We did not include partial use in our evaluation of the replacement program component as we assumed that all refrigerators retired through the replacement component were primary refrigerators that were plugged in year round. We used the program’s tracking database to determine the energy consumption of replacement refrigerators for the replacement program component.

³ AHAM (2010). *Trends in Energy Efficiency 2009*. July 6th, 2010.

⁴ AHAM (2003). *Refrigerators Energy Efficiency and Consumption Trends*. May 23rd, 2003.

⁵ http://www.nwcouncil.org/energy/rtf/meetings/2010/0629/ResFrigRecycle_FY10v2_1.zip

⁶ Source: 1998 Miller and Pratt study

⁷ Source: 2010 Cadmus evaluation of the California ARP

The equation below displays how we accounted for partial use and replacement equipment for the retirement program component.

$$\begin{aligned} Adjusted_{gross} = & [(UEC \times F_{partuse}) \times (1 - Replacement_{rate})] \\ & + [((UEC \times F_{partuse}) - New_{kWh}) \times (New_{pct} \times Replacement_{rate})] \\ & + [((UEC \times F_{partuse}) - Old_{kWh}) \times (Old_{pct} \times Replacement_{rate})] \end{aligned}$$

Where:

- $F_{partuse}$: Adjustment factor accounting for the partial use of recycled appliances*
- $Replacement_{rate}$: Percent of participants who reported replacing equipment*
- New_{kWh} : 2009 AHAM annual kWh consumption per unit
- New_{pct} : Portion of $Replacement_{rate}$ that is new appliances*
- Old_{kWh} : 2000 AHAM annual kWh consumption per unit
- Old_{pct} : Portion of $Replacement_{rate}$ that is used appliances*

The last step of our impact evaluation was to calculate net savings. Net savings were calculated by applying the free-ridership rate to the adjusted gross savings estimates. The calculation used to develop net savings is shown below:

$$Net_{savings} = Adjusted_{gross} \times (1 - FR)$$

Where:

- FR : Free-ridership rate* (from appliance retirement participant survey⁸)

The net savings estimates were multiplied by the total number of refrigerators and freezers retired through each program to develop total program savings attributable to the DSM Administrator.

3.1.1 Lab-to-On-site Factor

Manufacturer energy consumption estimates, such as AHAM's, are based on lab metering results that conform to DOE lab testing procedures.⁹ Using these procedures, refrigerators and freezers are metered in a controlled environment. In order to account for *in situ* factors such as appliance door openings, household size, and indoor temperature, we used a lab-to-on-site factor to develop UEC estimates.

Table 3-1 displays the lab-to-on-site differences for primary and secondary refrigerators in "cool" climates as reported in the 2010 evaluation of the California Appliance Retirement

⁸ Free-ridership for the replacement component of the program was based on the results from an in-depth interview.

⁹ http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title10/10cfr430_main_02.tpl

Program (ARP).^{[10][11]} The retirement program component likely includes both primary and secondary refrigerators and, of course, freezers. For this reason, we applied the lab-to-on-site ratios from the California ARP evaluation for both primary and secondary appliances in “cool” climate zones. The inclusion of secondary appliances affects the lab-to-on-site factor due to the potential location of secondary appliances. Secondary appliances are often located in unconditioned spaces, and are therefore exposed to ambient conditions which may impact the appliance’s energy consumption. We weighted the lab-to-on-site ratios by sample size to calculate a lab-to-on-site factor of 0.82 (Table 3-1). The equation below displays this calculation.

$$1 - \left[\left(\frac{29}{224} \times .308 \right) + \left(\frac{50}{224} \times .160 \right) + \left(\frac{86}{224} \times .213 \right) + \left(\frac{59}{224} \times .068 \right) \right] = 0.82$$

Table 3-1: California ARP Lab-to-On-site Differences for “Cool” Climate Zones*

California Results				
Primary Appliance	N	Household Size	Climate Zone	% <i>In Situ</i> Delta
Yes	29	1-2	Cool	-30.8%
	50	3+		-16.0%
No	86	1-2	Cool	-21.3%
	59	3+		-6.8%

*Source: Cadmus et al. (2010). *Residential Retrofit High Impact Measure Evaluation Report*. February 8th, 2010.

For the purposes of the evaluation of the Appliance Replacement program component, we only considered results for primary appliances from “cool” climate zones. We assumed that all refrigerators that were replaced by the Appliance Replacement program component were primary refrigerators as they were extracted from multifamily buildings where there is little room for a secondary refrigerator. The climate differences between California and Canada are less significant when considering primary refrigerators as these are almost always indoors at a relatively stable temperature.

We weighted each of the results in Table 3-1 based on sample size, to develop a lab-to-on-site factor of 0.79. Below is an example of this calculation.

$$1 - \left[\left(\frac{29}{79} \times .308 \right) + \left(\frac{50}{79} \times .160 \right) \right] = 0.79$$

¹⁰ Cadmus et al. (2010). *Residential Retrofit High Impact Measure Evaluation Report*. February 8, 2010.

¹¹ “Cool” refers to California climate zones 1 through 8 and 16. Climate zones 1 through 8 are located on the western coast of California. Climate zone 16 is the largest climate zone and covers much of California, including the northern region.

3.1.2 Degradation Factor

A number of refrigerator metering studies have found that refrigerators and/or freezers degrade over time, in turn increasing their annual energy consumption. The NMR team reviewed three reports to determine what degradation factor should be applied in Nova Scotia. These included a 2004 evaluation of Southern California Edison's Residential Appliance Recycling Program,¹² an evaluation of a 2009 Second Refrigerator Recycling Program (RRP) in Nevada,¹³ and a metering study of refrigerators in New York City Housing Authority apartments.¹⁴ The NMR team selected the latter as most relevant for this analysis.

In 1998, Miller and Pratt metered 95 existing and 15 new refrigerators in New York City Housing Authority (NYCHA) apartments. Miller and Pratt used the *in situ* meter results to develop a regression model that accounted for the impacts of variables such as climate, household size, door openings, and age on the annual energy consumption of refrigerators. Miller and Pratt found that refrigerators showed significant degradation over time and they estimated an annual degradation factor of 1.37%, meaning that the energy consumption of a refrigerator increases by 1.37% per year.

The NMR team selected the annual degradation factor reported by Miller and Pratt (1.37%) to develop an average UEC for the program. This value was selected due to the fact that the Miller and Pratt study metered 95 existing refrigerators, *in situ*, in multifamily buildings, in New York, where the seasonal ambient temperature is somewhat similar to that of Nova Scotia. While this study focused on refrigerators, we were unable to find a degradation rate specific to freezers. For this reason we applied the same degradation rate (1.37%) to freezers recycled through the retirement program component.

3.2 Appliance Retirement Program Component

3.2.1 Retirement Tracking Database

According to the program's tracking database, the Appliance Retirement program component picked up equipment between June and December of 2010. In that time, the program retired 2,341 refrigerators, 1,405 freezers and 706 dehumidifiers. The program assumed an average annual energy consumption for retired appliances of 1,437 kWh for refrigerators, 1,001 kWh for freezers, and 1,106 kWh for dehumidifiers. Due to the humid nature of the Nova Scotia climate, all dehumidifiers were assumed to be replaced by an ENERGY STAR unit that consumed 1,005 kWh per year. None of the other appliances were assumed to be replaced (Table 3-2).

¹² KEMA (2004). *2003 EM&V RARP Study: Verification, Degradation & Market Potential Analysis*. December 23, 2004.

¹³ ADM (2010). *2009 Second Refrigerator Recycling Program, NV Energy—Southern Nevada, Program Year 2009, Measurement & Verification Report*. February, 2010.

¹⁴ Miller and Pratt (1998). *Estimates of Refrigerator Loads in Public Housing Based on Metered Consumption Data*. New York City Housing Authority. October, 1998.

Table 3-2: Consumption Estimates for Appliances

	Retired Refrigerator	Retired Freezer	Retired Dehumidifier	Replacement Dehumidifier
Number of units	2,341	1,405	706	706
Annual energy consumption (kWh/year)	1,437	1,001	1,106	1,005

Based on the consumption estimates and number of units listed in Table 3-2, the tracking database reported program savings of 4,841 MWh at the meter and 5,416 MWh at the generator (Table 3-3). Savings at the generator were calculated by applying a line loss factor 1.1188.

Table 3-3: Tracking Database Savings—Retirement Program

Total Savings	Meter	Generator
Energy Savings (MWh)	4,841	5,416

3.2.2 Evaluated Impacts of Refrigerators and Freezers

The assumptions used to calculate the replacement program component impacts were based on the participant survey and a review of secondary research materials. In order to develop unique assumptions and accurately represent the program's participants, NMR evaluated the program's impacts based on three participant categories for refrigerators and two participant categories for freezers.

- Refrigerators:
 - Participants who retired and replaced a primary refrigerator.
 - Participants who retired and replaced a secondary refrigerator.
 - Participants who retired, but did not replace, a secondary refrigerator.
- Freezers:¹⁵
 - Participants who retired and replaced a secondary freezer.
 - Participants who retired, but did not replace, a secondary freezer.

¹⁵ All freezers were assumed to be secondary appliances.

Table 3-4 shows the distribution of participants by category. Most participants retired secondary appliances.

Table 3-4: Participant Categories

Participant Categories	Refrigerators	Freezers
<i>Sample Size</i>	35	28
Primary replaced	42%	--
Secondary replaced	17	50%
Secondary no replacement	42	50

Unit Energy Consumption

The impacts of refrigerators and freezers removed through the retirement program component were calculated using the methodology outlined above. That is, NMR used AHAM shipment weighted data to apply an initial annual energy consumption to each of the refrigerators and freezers retired through the program.¹⁶

Refrigerators and freezers each had an annual degradation rate of 1.37% applied to the initial AHAM consumption values.¹⁷ As previously mentioned, we developed a lab-to-on-site factor of 0.82 for refrigerators and freezers recycled through the retirement program component.

Initial values of 1,527 kWh per year for refrigerators and 1,194 kWh per year for freezers were developed using AHAM data and the annual degradation rate of 1.37%. After applying the lab-to-on-site factor we developed final UEC estimates of 1,252 kWh for refrigerators and 979 kWh for freezers. The UEC for both refrigerators and freezers were lower than the program's current assumptions (Table 3-5).

Table 3-5: Comparison of UEC Estimates for Retired Appliances

	Tracked		Evaluated	
	Refrigerator	Freezer	Refrigerator	Freezer
Unit energy consumption (kWh/year)	1,437	1,001	1,252	979

Partial Use Factor

A partial use factor was developed to adjust UEC estimates to reflect the adjusted gross savings of appliances that were removed through the replacement program component. The partial use factor is designed to account for the fact that not all refrigerators and freezers are plugged in year round. Secondary appliances are more likely to be unplugged for a portion of the year than

¹⁶ AHAM provides data based on manufacture year for refrigerators and freezers dating back to 1972.

¹⁷ The study which developed the degradation value of 1.37% only focused on refrigerators. We applied the same value to freezers as we could not determine an appropriate alternative.

primary appliances, and since secondary appliances were included in the program, the partial use factor is an important consideration when developing adjusted gross savings estimates.

Table 3-6 shows the amount of time that each participant category had their refrigerator or freezer plugged in during the year prior to having their appliance recycled through the program. Based on these responses we assumed the following plug-in patterns:

- All the time—appliance was plugged in for the entire year.
- Most of the time—appliance was plugged in for nine months of the year.
- Occasionally—appliance was plugged in for four months of the year.
- Never—appliance was never plugged in during the year prior to recycling.

Table 3-6: Amount of Time Appliance Plugged In¹⁸

	Refrigerators			Freezers	
	Primary Replaced	Secondary Replaced	Secondary No Replace	Secondary Replaced	Secondary No Replace
<i>Sample Size</i>	15	6	14	14	14
All the time	100%	83%	47%	93%	65%
Most of the time	--	17	20	--	--
Occasionally	--	--	27	--	21
Never	--	--	7	7	14

For each category of participants, usage (in months) was divided by 12 to develop the partial use factors for the various plug-in time frames. Below is an example of the partial use factor for participants who replaced a secondary refrigerator. Similar calculations were used to develop the partial use factors for the other participant categories.

Secondary Replaced (Refrigerator) Partial Use Factor

$$\left[\left(\frac{12}{12} \right) \times 0.83 \text{ Part plug} \right] + \left[\left(\frac{9}{12} \right) \times 0.17 \text{ Part plug} \right] + \left[\left(\frac{4}{12} \right) \times 0.0 \text{ Part plug} \right] + \left[\left(\frac{0}{12} \right) \times 0.0 \text{ Part plug} \right] = 0.96$$

¹⁸ Participants who had recycled a refrigerator through the program were asked if the refrigerator had been their primary or secondary refrigerator. Participants who said that it had been their primary refrigerator were assumed to have kept the appliance plugged in year round. Participants who had recycled a freezer through the program were not asked this question, so the same assumption did not apply.

Table 3-7 displays the partial use factors for refrigerators and freezers.

Table 3-7: Partial Use Factors

	Refrigerators			Freezers	
	Primary Replaced	Secondary Replaced	Secondary No Replace	Secondary Replaced	Secondary No Replace
<i>Sample Size</i>	15	6	14	14	14
Partial Use Factor	1.00	0.96	0.62	0.93	0.72

Replacement Equipment

According to the participant survey, of the participants who had refrigerators retired by the program, 42% had a primary refrigerator retired through the program, 17% had a secondary refrigerator retired through the program that they ultimately replaced, and 42% had a secondary refrigerator retired that they did not replace. For the purposes of our evaluation, we assume that all primary refrigerators retired through the program were ultimately replaced. One-half of the participants (50%) who had a freezer retired by the program reported that they replaced the unit.

Of the refrigerators that were replaced, 95% were replaced with a new refrigerator and 5% were replaced with a used refrigerator. For replacement freezers, 86% were new and 14% were used. New replacement equipment was assumed to have an annual energy consumption equivalent to the 2009 AHAM annual energy consumption estimates, while used replacement equipment was assumed to have an annual energy consumption equivalent to the 2000 AHAM annual energy consumption estimates. In the 2010 evaluation of the California ARP, it was found that used appliances that were five to ten years old had market value, while appliances older than that did not. Therefore, the 2000 AHAM estimates were selected for used replacement equipment as these values offer the most conservative estimates of annual energy consumption with regard to the adjusted gross savings of the program. We applied the lab-to-on-site factor (0.82) to the AHAM estimates in order to develop annual energy consumption estimates for replacement equipment. The final annual energy consumption for new and used replacement refrigerators was 369 kWh and 577 kWh respectively. The final value for new replacement freezers was 347 kWh per year, while the final for used replacement freezers was 390 kWh per year. (Table 3-8)

Table 3-8: Energy Consumption of Replacement Appliances

Annual energy consumption	Refrigerators	Freezers
2009 AHAM (kWh/year)	450	423
2000 AHAM (kWh/year)	704	476
Lab-to-on-site factor	0.82	0.82
New replacement equipment (kWh/year)	369	347
Used replacement equipment (kWh/year)	577	390

Adjusted Gross Savings

NMR adjusted the evaluated UECs (Table 3-5) to account for partial use and replacement equipment to develop adjusted gross savings estimates for refrigerators and freezers.

Table 3-9 displays the partial use factors for each of the participant categories, as well as the variables that were used to calculate the impacts of replacement equipment. As one would expect, the partial use factor was higher for equipment that was replaced than equipment that was not replaced. Most of the replacement refrigerators (93%) and freezers (86%) were new appliances.

Table 3-9: Partial Use Factors and Replacement Equipment Variables

Partial Use and Replacement Equipment Variables	Refrigerators			Freezers	
	Primary Replaced	Secondary Replaced	Secondary No Replace	Secondary Replaced	Secondary No Replace
Sample Size	15	6	14	14	14
Partial Use Factor	1.00	0.96	0.62	0.93	0.72
Percent of appliances replaced	100%	100%	--	100%	--
Percent of replacement appliances-new	93%	100%	--	86%	--
Percent of replacement appliances-used	7%	--	--	14%	--
New replacement (kWh/year)	369	369	--	347	--
Used replacement (kWh/year)	577	577	--	390	--

Based on Table 3-9, NMR adjusted the UECs to account for partial use and replacement equipment. An example of these adjustments for the secondary replaced refrigerator UEC is shown below:

$$\begin{aligned}
 & [(1,252_{UEC} \times 0.96_{part}) \times (1 - 1.0_{rep rate})] \\
 & + \left[\left((1,252_{UEC} \times 0.96_{part}) - 369_{new kWh} \right) \times (1.0_{New pct} \times 1.0_{rep rate}) \right] \\
 & + \left[\left((1,252_{UEC} \times 0.96_{part}) - 577_{old kWh} \right) \times (0.0_{Old pct} \times 1.0_{rep rate}) \right] = 833 kWh
 \end{aligned}$$

Similar calculations were applied to the other UECs. Table 3-10 shows the adjusted gross savings using each of the NMR methodologies.

Table 3-10: Adjusted Gross Savings per Unit (kWh/year)

	Refrigerators			Freezers	
	Primary Replaced	Secondary Replaced	Secondary No Replace	Secondary Replaced	Secondary No Replace
Adjusted gross savings	868	833	776	557	705

In order to calculate total program savings, we multiplied the number of units retired through the program by the proportion for each participant category and the adjusted gross savings estimates. Using this method, we develop total program savings estimates of 1,949 MWh for refrigerators and 887 MWh for freezers (Table 3-11). The program's tracking database estimated savings from refrigerators and freezers at 3,364 MWh and 1,948 MWh respectively. Our evaluated savings estimates represented a 42% decrease from the tracking database estimates for refrigerators and a 37% decrease for freezers.

Table 3-11: Refrigerator and Freezer Savings

	Refrigerators			Freezers	
	Primary Replaced	Secondary Replaced	Secondary No Replace	Secondary Replaced	Secondary No Replace
Number of units	2,341			1,405	
Program proportion	42%	17%	42%	50%	50%
Savings per unit (kWh/year)	868	833	776	557	705
Total savings (MWh/year)	853.9	331.5	763.2	391.6	495.2

3.2.3 Dehumidifiers

The program's tracking database currently assumes that all dehumidifiers retired through the program are ultimately replaced by ENERGY STAR qualified dehumidifiers. NMR reviewed two secondary sources to determine the annual energy consumption of both conventional and ENERGY STAR qualified dehumidifiers.

We reviewed the Ontario Power Authority's (OPA) "2010 Prescriptive Measures and Assumptions," which estimates savings for a wide range of residential efficiency measures.¹⁹ The results from this study were based on *in situ* metering of dehumidifiers for the OPA's Keep Cool Pilot Program. The OPA report assumes an average water removal capacity of 3.869 liters per day, an energy factor of 0.66 liters per kWh, and an annual operating time of 168 days. Combining these values, the OPA estimates a conventional dehumidifier consumes 984.84 kWh per year. Using the same removal capacity and annual operating time, but updating the energy factor to 1.34 liters per kWh, the OPA estimates an annual energy consumption of 485.07 kWh per year for ENERGY STAR qualified dehumidifiers.

We also reviewed a study conducted by PA Consulting and Patrick Engineering estimating the deemed savings of ENERGY STAR dehumidifiers for Wisconsin's Focus on Energy program (FOE).²⁰ This study was based on the review of a variety of secondary sources, and ultimately combined EPA estimated energy factors and AHAM estimated market shares (by capacity) to

¹⁹ Ontario Power Authority (2010). *2010 Prescriptive Measures and Assumptions*. January, 2010.

²⁰ PA Consulting and Patrick Engineering (2009). *Dehumidifiers Deemed Savings Review for Targeted Home Performance with ENERGY STAR*. March 19, 2009.

develop a weighted annual energy consumption estimate for both conventional and ENERGY STAR dehumidifiers. Specifically, the study looked at six capacity classes of dehumidifiers, all with varying energy factors, and developed annual consumption estimates for each capacity class based on an annual operating time of 921 hours.²¹ Energy consumption estimates for each of the capacity classes were weighted by their market share in Wisconsin to develop annual energy consumption estimates of 608 kWh for conventional dehumidifiers and 518 kWh for ENERGY STAR qualified dehumidifiers.

NMR ultimately used a combination of data from the FOE report and the DSM Administrator to develop savings estimates for dehumidifiers. From the FOE report, we extracted unit capacities, unit energy factors, and unit market shares (based on capacity) to include in our impact calculations. NMR received data from the DSM Administrator outlining some initial calculations for dehumidifier impacts. Within that data, the DSM Administrator had estimated annual operating time for dehumidifiers at 1,114 hours, which we applied to our impact calculations. We selected these values for a number of reasons:

- 1) The capacity of dehumidifiers in the FOE study seemed more reasonable than those used in the OPA study. Smaller dehumidifiers have a capacity range of 1-25 pints per day, an average of 9.5 liters per day. The OPA study assumed dehumidifiers had an average capacity of 3.869 liters per day, significantly lower than the average capacity of the smallest capacity class of dehumidifiers. The tracking data currently assumes a maximum average capacity of 22 liters per day. The FOE study had a capacity range of 9.5 liters per day to 61.5 liters per day—more in line with the program’s current assumptions than the OPA report.
- 2) Energy factors for conventional dehumidifiers range from 1.1 to 1.9 in the FOE report. Again, these values are more in line with the program’s estimate of 1.182 for any retired dehumidifier than the OPA’s estimate of 0.66.
- 3) The DSM Administrator used local weather data to calculate the estimated annual operating time of dehumidifiers (1,114 hours), which are likely more accurate than the operating time listed in the FOE report (921 hours).

The FOE report outlined the following DOE based calculation for determining dehumidifier consumption.

$$DEH\ Energy = CAP \times \left(\frac{0.473}{24} \right) \times \left(\frac{Hours}{Eff} \right)$$

Where:

- DEH Energy: Dehumidifier annual energy consumption (kWh/year)

²¹ The six capacity classes have the following average capacities: 9.5 liters per day, 14.2 liters per day, 18.9 liters per day, 23.4 liters per day, 30.5 liters per day, and 61.5 liters per day. These classes were developed by the DOE.

- CAP: Dehumidifier capacity (pints/day)
- 0.473: Conversion factor for liters in a pint
- 24: Hours per day
- Hours: Annual operating hours for a dehumidifier
- Eff: Dehumidifier efficiency (liters/kWh)

Using this equation and the values in Table 3-12, NMR developed an annual energy consumption of 735 kWh for conventional dehumidifiers.

Table 3-12: Conventional Dehumidifier—Annual Energy Consumption

Capacity*	Annual Operating Hours+	Unit Energy Factor (L/kWh)*	Annual Energy Consumption (kWh/year)*	Market Share*	Weighed Consumption (kWh/year)
9.5 liters/day	1,114	1.1	401	10%	40
14.2 liters/day	1,114	1.2	549	23.4%	129
18.9 liters/day	1,114	1.2	731	23.2%	170
23.4 liters/day	1,114	1.23	883	20.9%	185
30.5 liters/day	1,114	1.55	913	21.6%	197
61.5 liters/day	1,114	1.9	1,502	1%	15
Total consumption (kWh/year)	--	--	--	--	735

* Source: PA Consulting and Patrick Engineering (2009). *Dehumidifiers Deemed Savings Review for Targeted Home Performance with ENERGY STAR*. March 19, 2009.

+Source: DSM Administrator

Applying the same methodology displayed in Table 3-12, we developed an annual energy consumption estimate of 627 kWh for ENERGY STAR qualified dehumidifiers. (Table 3-13)

Table 3-13: ENERGY STAR Dehumidifier—Annual Energy Consumption

Capacity*	Annual Operating Hours+	Unit Energy Factor (L/kWh)*	Annual Energy Consumption (kWh/year)*	Market Share*	Weighed Consumption (kWh/year)
9.5 liters/day	1,114	1.2	367	10%	37
14.2 liters/day	1,114	1.4	471	23.4%	110
18.9 liters/day	1,114	1.5	585	23.2%	136
23.4 liters/day	1,114	1.6	679	20.9%	142
30.5 liters/day	1,114	1.6	885	21.6%	191
61.5 liters/day	1,114	2.5	1142	1%	11
Total consumption (kWh/year)	--	--	--	--	627

* Source: PA Consulting and Patrick Engineering (2009). *Dehumidifiers Deemed Savings Review for Targeted Home Performance with ENERGY STAR*. March 19, 2009.

+Source: DSM Administrator

Our evaluated UEC estimates for both conventional and ENERGY STAR qualified dehumidifiers were significantly lower than those listed in the tracking spreadsheet (Table 3-14).

Table 3-14: Dehumidifier UEC Estimates

	Tracked		Evaluated	
	Conventional	ENERGY STAR	Conventional	ENERGY STAR
Unit energy consumption (kWh/year)	1,106	1,005	735	627

In order to calculate savings, NMR multiplied the UEC estimates of 735 kWh for conventional retired units and 627 kWh for ENERGY STAR replacement units to develop the total consumption for both retired and replacement units. Subtracting replacement units from retired units we estimate dehumidifier savings at 63,540 kWh—7.6% higher than program estimates (Table 3-15). It is interesting to note that while our evaluated UEC estimates were lower than the program's estimates, our per unit savings estimate was actually higher.

Table 3-15: Total Program Savings—Dehumidifiers

Total Savings	Tracked Savings	Evaluated Savings
Number of units	706	706
Savings per unit (kWh)	100	108
Energy Savings (kWh)	70,849	76,248

3.2.4 Total Program Impacts

Table 3-16 shows a comparison of the tracked and evaluated savings for each of the four appliances retired through the program. Evaluated savings were lower than the tracked savings for all measures except room air conditioners—the program did not calculate savings for these units.

Table 3-16: Program Savings by Measure

	Refrigerators	Freezers	Dehumidifiers
Number of units	2,341	1,405	706
Tracked savings per unit (kWh)	1,437	1,001	100
Evaluated savings per unit (kWh)	832	631	108
Tracked savings (MWh)	3,364	1,406	71
Evaluated savings (MWh)	1,948	887	76

We estimated overall gross program savings, across all four measures retired by the program, to be 2,911MWh at the meter and 3,256 MWh at the generator—40% below the program’s tracked savings estimates. (Table 3-17)

Table 3-17: Replacement Program Energy Savings

Total Savings	Tracked		Evaluated	
	Meter	Generator	Meter	Generator
Energy Savings (MWh)	4,841	5,416	2,911	3,256

We calculated the demand savings for the replacement program by obtaining the ratio of all residential target peak demand savings to target energy savings for the Efficient Products—Retail Program. This ratio was taken from the adjusted 2010 DSM Targets.²² Based on an energy-to-demand ratio of 4.8, we calculated demand savings of 607 kW at the meter and 680 kW at the generator. (Table 3-18)

Table 3-18: Replacement Program Demand Savings

	Meter	Generator
Total savings (MWh/year)	2,915	3,262
Energy-Demand ratio	4.8	4.8
Demand savings (kW)	607	680

3.3 Appliance Replacement Program Component

3.3.1 Replacement Tracking Database

According to its tracking database, the replacement program component replaced refrigerators in multifamily residential buildings from August to December of 2010. In that period, 305 units were replaced by the program. The tracking database estimated that the average annual energy consumption of retired refrigerators was 950 kWh, while the average annual energy consumption of replacement refrigerators was 363 kWh.²³ (Table 3-19)

Table 3-19: Refrigerator Energy Consumption—Tracking Database

	Retired Refrigerator	Replacement Refrigerator
Number of units	305	305
Annual energy consumption (kWh/year)	950	363

²² Per Program Development Working Group on January 26, 2010.

²³ All replacement refrigerators were ENERGY STAR qualified.

Based on these estimates the tracking spreadsheet calculations determined that the replacement program saved 179 MWh at the meter and 200 MWh at the generator. Savings at the generator were calculated by applying a line loss factor of 1.1188. (Table 3-20)

Table 3-20: Tracking Database Savings—Replacement Program

Total Savings	Meter	Generator
Energy Savings (MWh)	179	200

3.3.2 Evaluated Program Impacts

Based on the program's tracking database, NMR determined that the program was replacing retired equipment with two different types of ENERGY STAR qualified refrigerators.²⁴ We referenced the ENERGY STAR website to determine the manufacturer reported energy consumption of these refrigerators.²⁵ Using these values, we developed an average annual energy consumption of 353 kWh per year for replacement refrigerators. An initial average consumption estimate of 906 kWh per year was developed for retired refrigerators by using AHAM data and an annual degradation factor of 1.37%.²⁶ The lab-to-on-site factor of 0.79 was applied to both retired and replacement refrigerators, leading to final UEC estimates of 716 kWh and 279 kWh respectively (Table 3-21). These values were significantly lower than UEC estimates from other studies. NMR conducted a study of Efficiency Maine's Appliance Replacement program and found that retired refrigerators consumed 1,824 kWh per year.²⁷ The 2010 evaluation of the California ARP found an average consumption value of 1,158 kWh across three utilities.²⁸ At first glance it may seem that we have underestimated the energy consumption of retired refrigerators, but there are reasons for these differences. The primary reason for these differences is that the replacement program component retired primary refrigerators with an average manufacture year of 1993. The evaluations referenced above included secondary refrigerators and often included refrigerators much older than those retired in the replacement program.

²⁴ The two models of refrigerators being installed by the program are GE GTH16BBXRWW and GE GTH18HBTWW.

²⁵ http://www.energystar.gov/index.cfm?fuseaction=refrig.search_products_submit

²⁶ A degradation factor was not applied to the replacement refrigerators as we assumed these refrigerators were brand new.

²⁷ NMR (2007). *Process and Impact Evaluation of the Low Income Appliance Replacement Program*. December 21, 2007.

²⁸ Cadmus et al. (2010). *Residential Retrofit High Impact Measure Evaluation Report*. February 8, 2010.

Table 3-21: UEC Estimates for Retired and Replaced Refrigerators

	Retired Refrigerator	Replacement Refrigerator
Annual energy consumption ²⁹	906	353
Lab-to-on-site factor	0.79	0.79
Unit energy consumption (kWh/year)	716	279

NMR multiplied the average UEC estimates in Table 3-21 by the refrigerators replaced by the program to develop total consumption estimates of 218 MWh per year for retired refrigerators and 84 MWh kWh per year for replacement refrigerators, resulting in total program savings of 134 MWh at the meter and 150 MWh at the generator.³⁰ These savings represented a 25% decrease in comparison to the tracked savings estimates. (Table 3-22)

Table 3-22: Replacement Program Energy Savings

	Tracked	Evaluated
Total number of units	305	305
Unit energy consumption—retired (kWh/year)	950	716
Unit energy consumption—replaced (kWh/year)	363	279
Total retired refrigerator consumption (MWh/year)	290	218
Total replacement refrigerator consumption (MWh/year)	111	84
Total savings at the meter (MWh/year)	179	134
Total savings at the generator (MWh/year)	200	150

We calculated the demand savings for the replacement program component by obtaining the ratio of all residential target peak demand savings to target energy savings for the Efficient Products—Retail Program. This ratio was taken from the adjusted 2010 DSM Targets. Based on an energy-to-demand ratio of 4.8 we calculated demand savings of 27.9 kW at the meter and 31.2 kW at the generator (Table 3-23).

Table 3-23: Replacement Program Demand Savings

	Meter	Generator
Total savings (MWh/year)	133.8	149.8
Energy-Demand ratio	4.8	4.8
Demand savings (kW)	27.9	31.2

²⁹ The annual energy consumption for retired refrigerators includes a degradation factor of 1.37% per year. Replacement refrigerators did not include this adjustment because we assumed they were all brand new units.

³⁰ Two refrigerators did not have a replacement refrigerator listed, so we assumed these refrigerators were not replaced.

3.4 Free-ridership

NMR estimated free-ridership rates for each retired appliance. These estimates were based on the survey of Appliance Retirement Program participants which asked questions about the actions that respondents would have taken in the absence of the program.

In general, free-riders (FRs) were considered to be participants who either would have kept the unit unplugged in the absence of the program, or before learning about the program had intended to remove the appliance within one year in a manner that would not lead to its being used by someone else. Non-free-riders (NFRs) were participants who either would have kept using the appliance, or would have removed the appliance more than one year after the program, or would have removed the appliance in a manner that would lead to its use by someone else. Replacement appliances impact the energy savings of the program but were not considered in estimating free-ridership rates.

3.4.1 Estimation of Free-ridership Rates

We estimated free-ridership rates for each appliance type by determining the FR status of respondents on the basis of questions about the intended disposition of appliances in the absence of the program.

- Respondents who said they would have kept the appliance unplugged were considered to be free-riders (FRs).
- Those who would have disposed of the appliance without the program were considered to be:
 - Non-free-riders (NFRs) if they said they would have sold it or given it away (as the appliance would still be in use);
 - FRs if they said they would have recycled it or taken it to a trash dump;
 - Possible free riders (PFRs) if they said they would have had the appliance picked up by a third party (i.e., a hauler or a retail store), as some of these appliances might have been re-sold on the secondary market.
- Respondents who said they would have disposed of the appliance more than a year from the time it was picked up by the program were considered to be NFRs.
- Respondents who said they had not considered removing the appliance before they heard about the program, but later said they would have either gotten rid of it without the program or that they would have kept it and continued using it, were determined to be NFRs.
- Respondents whose responses did not allow them to be categorized as either FR or NFR (e.g., respondents who said “don’t know” to certain questions or gave responses that didn’t clearly determine their FR or NFR status) were considered to be possible FRs (PFRs).

Two additional questions asked respondents about possible financial barriers to their disposal decision. One of these questions asked respondents whether, in the absence of the program, their

budgets would have been able to accommodate the cost of having the appliance picked up and recycled by a third party, which they were told would be about \$60. The second question asked how much, if anything, respondents would have been willing to pay a hauler or someone else to take away the appliance if the program had not been available. Respondents who said they would have recycled the appliance or hired a hauler to remove it, but that they were not willing to pay anything to do so, were determined to be NFRs.

3.5 Free-ridership Rates

3.5.1 Appliance Replacement Component

As shown in Table 3-24, the free-ridership rate was 31% for refrigerators, 18% for freezers, and 47% for dehumidifiers. Among the refrigerator group, 56% were non-free-riders (NFR) and 13% were possible free-riders (PFRs); among the freezer group, 75% were NFRs and 7% were PFRs. Among the dehumidifier group, 47% were NFRs and 6% were PFRs.

Table 3-24: Free-ridership Rates

	Refrigerators (n=36)	Freezers (n=28)	Dehumidifiers (n=15)
FR (free-riders)	31%	18%	47%
NFR (non-free-riders)	56	75	47
PFR (possible free-riders)	13	7	6

Free-ridership rates were also calculated separately for respondents who replaced the appliance that had been removed through the program with another unit versus respondents who had not replaced it. The refrigerator group was further divided by use of the removed appliance, yielding three subgroups: 1) respondents who removed a primary fridge (nearly all of whom replaced it with another unit), 2) those who removed a spare fridge that they replaced with another unit, and 3) those who removed a spare fridge that they did not replace. As only four out of the fourteen respondents who removed a dehumidifier through the program reported that they had not replaced it, free-ridership rates were not calculated for subgroups within the dehumidifier group.

More than two out of five respondents (42%) in the refrigerator group removed a primary refrigerator. As shown in Table 3-25, those who had used the program to dispose of a primary refrigerator were much more likely to be a free-rider (40%) than those who had disposed of a secondary unit (20% overall), and respondents who had removed secondary units were less likely to be free-riders if they had replaced the unit (17%) than if they had not replaced it (27%).

Table 3-25: Refrigerator Free-ridership Rates by Use and Replacement

	Primary (42% of refrigerators)	Secondary— Replaced (17% of refrigerators)	Secondary— Not Replaced (42% of refrigerators)
FR (free-riders)	40%	17%	27%
NFR (non-free-riders)	27	83	73
PFR (possible free-riders)	33	0	0

The free-ridership rate for the one-half of the freezer group who had replaced the removed freezer with another unit was much higher than that for the one-half who had not replaced the unit (27% versus 7%). (Table 3-26)

Table 3-26: Freezer Free-ridership Rates by Replacement

	Replaced (50% of freezers)	Not Replaced (50% of freezers)
FR (free-riders)	27%	7%
NFR (non-free-riders)	57	93
PFR (possible free-riders)	14	0

3.5.2 Appliance Replacement Component

NMR was able to conduct only one in-depth interview with a participant in the Appliance Replacement program component. NMR determined that it was not appropriate to project the free ridership estimate from this interview to all program participants. For this reason, a free ridership estimate was not developed for the Appliance Replacement program component, and the savings estimates developed by NMR are gross savings that do not account for any potential program free ridership.

3.6 Net Savings Estimation

Table 3-27 presents the net installed annual energy and demand savings for the 2010 ARR program. The net annual savings were based on the original population tracking savings, and the net-to-gross ratio based on the participant survey. Please note that the savings associated with the Appliance Replacement program component are gross savings and do not account for any potential program free ridership.

For the 2010 program year, the generator-level impacts were estimated at 2,286 MWh of energy savings and 476.4 kW of demand savings.

Table 3-27: 2010 Final Energy and Demand Savings Summary

	Gross Savings at Generator		Net-to-Gross Ratio (%)	Net Savings at Generator	
	Demand (kW)	Energy (MWh)		Demand (kW)	Energy (MWh)
Appliance Retirement					
Primary refrigerators—replaced	177.9	853.9	60%	106.7	512.3
Secondary refrigerators—replaced	69.1	331.5	83%	57.4	275.1
Secondary refrigerators—not replaced	159.0	763.2	73%	116.1	557.1
Secondary freezers—replaced	81.6	391.6	73%	59.6	285.9
Secondary freezers—not replaced	103.2	495.2	93%	96.0	460.5
Dehumidifiers	17.8	85.3	53%	9.4	45.2
Appliance Replacement					
Refrigerators	31.2	149.8	100%	31.2	149.8
Total Program	639.8	3,070.5		476.4	2,285.9

4 Process Evaluation

4.1 Methodology

The 2010 process evaluation of the Appliance Retirement and Replacement program drew upon in-depth interviews conducted with program staff, contractors, and participants, as well as a survey of program participants.

4.1.1 In-depth Interviews

NMR staff conducted six in-depth interviews with program implementation and contractor staff in November and December of 2010. Three interviews were conducted with program implementation staff—one each with the DSM Administrator's program manager, the implementation contractor's project manager, and the project manager of the subcontractor. Three interviews were conducted with program contractors—one each with the recycling contractor, the appliance pickup contractor for the Retirement program component, and the appliance retailer for Appliance Replacement program component. The interviews covered a variety of program-related topics including program goals, program theory, pick-up, removal and delivery.

4.1.2 Survey of Appliance Retirement Participants

Between September and November 2010, NMR completed a total of 70 interviews with customers who had retired appliances through the Appliance Retirement program component. The survey included questions about various aspects of program satisfaction, sources of information, motivations and barriers, free-ridership, program value, and recommendations for improvement. The survey respondents had retired a total of 79 appliances including 36 refrigerators, 28 freezers, and 15 dehumidifiers. The sample of participants was provided by the DSM Administrator from its program tracking database. According to the tracking database, the Appliance Retirement program had a total of 3,675 participants who had retired a total of 4,452 appliances including 2,341 refrigerators, 1,405 freezers and 706 dehumidifiers. As Table 4-1 shows, the participants in the population and the sample had retired roughly similar proportions of each appliance.

Table 4-1: Appliances Retired in Population and Sample

	Population		Sample	
	Count	Percent	Count	Percent
Refrigerators	2,341	53%	36	46%
Freezers	1,405	32%	28	35%
Dehumidifiers	706	16%	15	19%
Total	4,452	100%	79	100%

4.1.3 Sampling Error

Table 4-2 shows the estimated population, sample size and sampling error for the survey of Appliance Retirement participants. For the total survey, the sampling error was $\pm 9.7\%$ at the 90% confidence level. The sampling error for each of the appliance groups varied: $\pm 13.6\%$ for participants who had retired refrigerators, $\pm 15.4\%$ for participants who had retired freezers, and $\pm 21\%$ for participants who had retired dehumidifiers.

Table 4-2: Sample Size and Sampling Error

	Population	Sample Size	Sampling Error at 90% Confidence Interval
Refrigerators	2,341	36	$\pm 13.6\%$
Freezers	1,405	28	$\pm 15.4\%$
Dehumidifiers	706	15	$\pm 21.0\%$
Total	3,675	70	$\pm 9.7\%$

4.2 Program Planning and Communications

The ARR program was a pilot and, as such, had to contend with a variety of issues not uncommon in pilot programs that, in addition to being new, are generally operated for only a limited time. Many of these issues were associated with compressed program planning and communications.

4.2.1 Appliance Retirement Program Planning

The recycling and appliance pickup contractors observed that, after being awarded the contract, they had little lead time to plan and prepare for program implementation. Furthermore, the program start date in mid-June added to their challenges because it was busy season for their businesses and as such, they had to scramble to find and train additional drivers for the program. They proposed moving the program start date to the fall to coincide with the peak season for buying appliances in Nova Scotia and allow them time to prepare for their role in the program; however, the decision had already been made start the program in mid-June.

When the program was extended to a second phase, the pickup contractor remarked that it had struggled with problems affecting customer service. These included a website that had not yet been enabled to allow customer registrations and an inability to take phone calls because the phone lines had not been transferred to an outsourced new call center.

4.2.2 Appliance Retirement Program Staffing

The recycling contractor was of the opinion that the appliance pickup contractor would be more comfortable if the Appliance Retirement program were province-wide and for a one or two year term. This would allow them to invest in permanent drivers and focused training to perform the appliance pickups. In contrast, the pickup contractor voiced expressed concerns about the low density of population in Nova Scotia and the costs of managing routes where there can be long distances between residences.

4.2.3 Appliance Replacement Program Schedule

In in-depth interviews, program delivery staff expressed some concerns about the timing of the program. Specifically discussing the Appliance Replacement program, one respondent observed that the multi-residential program had faced a number of challenges associated with program marketing and outreach including:

- Summer is a difficult time to get a hold of property managers/building owners;
- Replacement requires a capital investment that many not be in the budget at the time of program contact;
- Getting to decision-makers is a long and difficult process.

4.3 Program Administration and Delivery

4.3.1 Internal Communications

The ARR program included a wide variety of organizations who worked together to deliver the program. These organizations included: the DSM Administrator, a contractor and subcontractor responsible for managing the two components of the program, a call center, an appliance pickup contractor, a recycling contractor, and an appliance retailer for the replacement program component. Internal communication amongst such a wide variety of organizations is difficult and it is perhaps not surprising that some of the organizations involved reported communication problems.

Perhaps the largest oversight in communication came when the decision was made to extend the program into a second phase. The pickup contractor was only informed of the extension after it had been announced on television. In fact, during the in-depth interviews, NMR staff learned of the planned extension and mentioned it to the recycling contractor a few days later during an in-depth interview; at that time, the recycling contractor had still not been informed about the extension.

Perhaps indicative of additional communication oversights, previously noted errors with starting up customer registration and the call center capabilities delayed implementation of the second phase. Notwithstanding efforts to build off of the momentum gained in the first phase of the program, the second phase did not include the same level of marketing and outreach as the first phase, contributing to lower than anticipated participation.

While not as egregious as failing to inform subcontractors about the extension of the program, communication problems between the call center and the contractor contributed to delayed delivery of program results to the DSM Administrator. In addition, at the start of the program, communication issues delayed the delivery of the postal codes served by the program to the pickup contractor.

Despite these oversights, the extension of the program was not without its benefits. During phase two, the program changed call centers and, according to one contractor, this change led to an increased level of customer service, due primarily to the expanded hours of operation.

4.3.2 Administrative Structure and Processes

Out of necessity, many pilot programs are designed to operate for a limited time period and often in a limited geographical area. This allows program administrators to experiment with new programs that may prove to be infeasible due to program administration, costs, or consumer interest. A limited time period also allows program staff to evaluate pilot results quickly so that decisions can be made regarding the future of potential programs. However, these constraints can also serve as barriers to program performance in the short-term. The ARR program is no exception. One contractor commented that the ARR program would have benefited from additional program staff that would be able to concentrate primarily on the ARR program and would not be distracted by the need to attend to other projects. When evaluating the performance of the ARR program, DSM Administrator staff should keep in mind that some of these issues will not occur in a program that operates over a longer period of time.

Also, in any future program, one contractor suggested that in an effort to decrease free-ridership, the call center should make it clear that the program would accept and pickup only those appliances that were currently plugged in, working, and received regular use. While pickup drivers asked customers a series of questions related to prior intentions, once the customer information had been passed on to the pickup contractor and the customer was scheduled for a pickup, it was decided that customers would still receive the removal service.

4.4 Program Information Sources and Enrollment

4.4.1 Participant Perspectives – Appliance Retirement

Survey respondents were asked how they had first become aware of the program (Table 4-3). As they might have heard of the program from more than one source, respondents were given the opportunity to provide multiple responses. Two out of three respondents (66%) had learned about the program from advertising, including bill inserts and mailings as well as newspaper, radio, and television ads. One in five respondents (20%) said they had found out about the program through word-of-mouth, from a colleague, friend or family; and one in ten (10%) mentioned they had heard through Internet in general.

Table 4-3: How Participants Found Out About the Program

Sources (multiple responses)	All Respondents
<i>Sample size</i>	70
Utility/Sponsor advertising in newspaper, radio, TV	49%
Co-worker, family, or friend	20%
Bill insert/ mailing from utility/Sponsor	17%
Internet-unspecified	10%
Utility/Sponsor website	3%
Appliance retailer/dealer	1%
Salesperson	1%
Other	1%
Don't know/refused	1%

More than two out of three respondents (70%) had enrolled in the program over the phone, and nearly one in three (29%) had enrolled online. (Table 4-4)

Table 4-4: How Participants Enrolled in Program

Method of enrollment	All Respondents
<i>Sample size</i>	70
Over the phone	70%
Online	29
Don't know/refused	1

On the whole, respondents had found it to be relatively easy to enroll in the program, whether they had enrolled by phone or online (Table 4-5). On a scale of one (“extremely difficult”) to five (“extremely easy”), nine out of ten respondents who had enrolled over the phone (89%) and everyone (100%) who had enrolled online, gave a rating of four or five. Only four percent of respondents, all of whom had enrolled over the phone, thought enrolling had been difficult, giving a rating of one or two. When asked to describe specific difficulties with enrolling, responses included having to wait a long time for a call back and the call center requiring a postal code with the address.

Table 4-5: Ease of Program Enrollment by Phone and Online

Level of Ease	Enrolled Online	Enrolled Over the Phone	Total
<i>Sample size</i>	20	49	70*
Average	4.8	4.6	4.6
1 “Extremely difficult”	0%	2%	1%
2	--	2	1
3	--	6	4
4	20	18	19
5 “Extremely easy”	80	71	74

* Includes one respondent who did not remember how they signed up.

In general, respondents had found it to be relatively easy to schedule a time for their appliances to be picked up by the program (Table 4-6). On a scale of one (“extremely difficult”) to five (“extremely easy”), the average difficulty rating was 4.5, with 80% of the respondents giving a rating of four or five. Few respondents (7%) gave a rating of less than three. Most of these respondents said that there had been mix-ups in the scheduling or communications regarding the scheduling.

Table 4-6: Ease of Scheduling Time for Pick-up

Level of Ease	All Respondents
<i>Sample size</i>	70
Average	4.5
1 “Extremely difficult”	6%
2	1
3	11
4	9
5 “Extremely easy”	71
Don’t know / Refused	1

4.4.2 Participant Perspectives – Appliance Replacement

The participant interviewed for the Appliance Replacement program said she had found out about the program when she called the DSM Administrator to inquire about a lighting program she had heard of from an electrician. She signed up for the Appliance Replacement program through email and found the sign up and scheduling processes to be ‘extremely easy.’

4.5 Motivations for Participation

4.5.1 Participant Perspectives – Appliance Retirement

Respondents were also asked why they had decided to dispose of their appliance. Overall, the program’s offer to pick up the appliance appeared to be the primary motivation for the refrigerator and freezer groups. As Table 4-7 shows, about two out of five respondents in each group cited reasons related to the program’s pick up facility as the reason they had decided to dispose of the appliance: 39% of the refrigerator group mentioned that the program made it easy or convenient to turn in the appliance (22%) or that the program would pick it up (17%); 39% of the freezer group also said that the program made it easy or convenient to turn in the appliance (18%) or that the program would pick it up (21%).

In contrast, the primary motivation for the dehumidifier group appeared to be the desire to save energy use or costs: two out of five respondents in the dehumidifier group mentioned wanting to reduce energy/electricity costs (20%) or to save energy/electricity (20%).

The single largest reason for disposing of their appliance cited by the refrigerator group (28%) was that they had bought a new refrigerator; the single largest reason cited by the freezer (36%) and dehumidifier (33%) groups was the incentive.

Table 4-7: Why Participants Decided to Dispose of Appliance
(multiple responses)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Bought new refrigerator / freezer / dehumidifier	28%	18%	13%
Easy/convenient to turn it in	22%	18%	20%
Rebate/incentive	19%	36%	33%
They would pick it up	17%	21%	--
Better for the environment	14%	11%	13%
Wanted to recycle	8%	4%	--
Old unit was not working well	6%	14%	20%
Save energy/electricity	6%	--	20%
Reduce energy/electricity costs	3%	14%	20%
Didn't need/use it any more	3%	11%	7%
Cost too much to have it picked up	3%	4%	--
Did not want to pay disposal fee at dump/recycling center	3%	7%	--
Moving soon/just moved	--	4%	7%
Reduce maintenance costs/appliance needed repairs	--	4	--
Other	8%	--	--
Don't know/Refused	3%	--	--

4.5.2 Participant Perspectives – Appliance Replacement

The Appliance Replacement participant interviewed said that, while she did not replace all of her properties' refrigerators, she had targeted those refrigerators that were in the worst condition. According to this participant, most of the refrigerators replaced were more than 20 years old. When asked why she had decided to replace the refrigerators, her reasons varied based on who was responsible for the electric bills. For units where the tenants were responsible for the electric bill, she replaced the refrigerators because they were near the end of their useful lives (old); for units where the tenants were not responsible for the electric bill, she replaced the refrigerators in order to take advantage of cost savings due to lower utility bills. In addition, she said that the rebate, the price of refrigerators, and the removal and recycling services had been very influential in her decision to participate. She went on to say that the combination of removal, recycling, and replacement together had made a big difference.

4.5.3 Staff and Contractor Perspectives

Program staff and contractors believed that cost savings were the primary motivation for participants in the retirement program, but customers also participated because they wanted to do the right thing and they appreciated the ease of having appliances picked up from their homes.

In an in-depth interview, a program contractor observed that customers participated in the program because it was very simple for them to do so. She added that customers have only one opportunity per year through CBRM (Cape Breton Regional Municipality) to have their appliances picked up and have the Freon removed. They have to arrange the pickup themselves and pay a \$50-60 fee. In contrast, the ARR program went out and picked up the old appliance and gave them a rebate.

Program staff believed that property managers participated in the replacement component of the program because of the cost savings. In addition, one contractor commented that if the program did not exist, property owners or managers would have to go to the manufacturer directly to replace a large number of refrigerators and they would have to pay a higher price. This contractor believed that these barriers would result in many of the refrigerators not being replaced.

4.6 Participation Decision

4.6.1 Prior Plans

Respondents were asked if they had already considered getting rid of the refrigerator, freezer, or dehumidifier before they had heard about the program. About three out of four respondents in each appliance group reported that they had considered disposing of the appliance before they heard about the Appliance Retirement program.

Table 4-8: Whether Participants Had Considered Disposing of Appliance

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Yes	75%	75%	73%
No	25	25	27

4.6.2 Ability and Willingness to Pay for Recycling

The respondents were asked if they had not received these services for free from the program administrator, could their budget have accommodated the full \$60 cost of recycling the appliance. About two out of three respondents in the refrigerator (69%) and dehumidifier (67%) groups, and four out of five respondents in the freezer (79%) group said that their budget could have accommodated the full cost of removal. (Table 4-9)

Table 4-9: Respondents' Ability to Bear the Full Cost of Recycling

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Yes	69%	79%	67%
No	22	14	20
Don't know/refused	8	7	13

The respondents were also asked how much (if anything) they would have been willing to pay for someone to remove the appliance from their home. About one-third of the refrigerator group, nearly one-half of the freezer group, and three-fifths of the dehumidifier group said they would not have been willing to pay anything to have it removed or recycled. Respondents who said they would have been willing to pay for the removal of the appliance reported a willingness to pay an average of \$42 for refrigerator removal, \$47 for freezer removal, and \$37 for dehumidifier removal. (Table 4-10)

Table 4-10: Amount Willing to Pay to Remove Appliance

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
\$0	31%	46%	60%
1-25	19	7	14
26-50	25	39	
51-75	9	8	
76-100	6	--	6
Don't know/refused	11	--	20
Average*	\$42	\$47	\$37

* Refrigerators (n=21); Freezers (n=15); Dehumidifier (n=3)

4.6.3 Program Influence on Participation Decision

Participant Perspectives – Appliance Retirement

The survey respondents were asked questions about the influence of various aspects of the program on their decision to participate in the Appliance Retirement program. They were first asked to rate the importance of the incentive on their decision to participate, using a scale of one (“no influence”) to five (“extremely influential”). Next, they were asked to rate the influence of information or advice they had received from the program. Finally, they were asked to rate the influence of the removal and recycling services provided for free as part of the program. (Table 4-11 through Table 4-13)

Across all three appliance groups, the single most influential factor by far was the removal and recycling services provided for free as part of the program. Compared to the other two factors, nearly twice as many respondents in each appliance group rated this factor as extremely influential.

As Table 4-11 shows, within the refrigerator group, 95% of respondents said the removal/recycling services had influenced their participation decision and 81% rated this program aspect as extremely influential. Within the freezer group, 90% of respondents said the removal/recycling services had influenced their participation decision and 86% rated this program aspect as extremely influential. Within the dehumidifier group, 93% of respondents said the removal/recycling services had been extremely influential to their participation decision.

Table 4-11: Influence of Free Removal/Recycling on Participation Decision

Influence of Free Removal/Recycling	Refrigerators	Freezers	Dehumidifiers
<i>Sample Size</i>	36	28	15
Mean	4.7	4.7	4.9
5“Extremely influential”	81%	86%	93%
4	14	4	--
3	3	7	7
2	--	--	--
1“No influence”	3	4	--

The DSM Administrator incentives generally tended to receive the lowest ratings of all three influence factors. As Table 4-12 shows, within the refrigerator group, 58% of respondents said the \$35 incentive had influenced their participation decision and 44% rated this program aspect as extremely influential. Within the freezer group, 50% of respondents said the \$35 incentive had influenced their participation decision and only 32% rated this program aspect as extremely influential. Within the dehumidifier group, 67% of respondents said the \$10 incentive had been extremely influential to their participation decision.

Table 4-12: Influence of Incentive* on Program Participation Decision

Influence of Incentive	Refrigerators	Freezers	Dehumidifiers
<i>Sample Size</i>	36	28	15
Mean	3.9	3.3	3.8
5“Extremely influential”	44%	32%	67%
4	14	18	--
3	31	21	7
2	6	4	--
1“No influence”	6	25	27

* Incentive amounts: \$35 for refrigerators and freezers; \$10 for dehumidifiers

As Table 4-13 shows, within the refrigerator group, 75% of respondents said the program information/advice had influenced their participation decision and 47% rated this program aspect as extremely influential. Within the freezer group, 71% of respondents said the program information/advice had influenced their participation decision and 46% rated this program aspect as extremely influential. Within the dehumidifier group, 60% of respondents said the program information/advice had influenced their participation decision and 53% rated this program aspect as extremely influential. Note, however, that a substantial number of respondents in the dehumidifier group gave a “Don’t know/Refused” response, suggesting that they had not been given any information or advice.

Table 4-13: Influence of Program Information/Advice on Participation Decision

Influence of Information/Advice	Refrigerators	Freezers	Dehumidifiers
<i>Sample Size</i>	36	28	15
Mean	4.1	4.2	4.0
5“Extremely influential”	47%	46%	53%
4	28	25	7
3	17	21	7
2	8	--	--
1“No influence”	--	4	13
Don’t know / Refused	--	4	20

Participant Perspectives – Appliance Replacement

The Appliance Replacement participant who was interviewed was asked similar questions about the influence of various aspects of the program on their decision to participate in the Appliance Replacement program. This participant said that the incentive provided and the removal and recycling services had both been “extremely influential” but that the information or advice she received had been only somewhat influential (rated a 3).

4.7 Actions in Absence of Program

4.7.1 Participant Perspectives – Appliance Retirement

Respondents were asked what they would have done with the appliance if the program had not been available. Around one-half of the respondents in the refrigerator (56%) and dehumidifier (47%) groups said they would have gotten rid of it in some way. In contrast, nearly three out of four respondents in the freezer group (71%) said they would have postponed getting rid of the appliance by more than one year. Very few respondents in the refrigerator (6%) and dehumidifier (7%) groups and none of the respondents in the freezer group said they would have kept the appliance. (Table 4-14)

Table 4-14: Action in Absence of the Program—Refrigerators

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Postponed getting rid of the appliance by more than one year	39%	71%	47%
Not have gotten rid of the appliance—Kept it	6	--	7
Gotten rid of the appliance anyway	56	29	47

Practically all of the respondents who would have gotten rid of their appliances said they would have disposed of it within one year of when they had it removed by the program. (Table 4-15)

Table 4-15: Timing of Disposal in Absence of the Program

(Base: Respondents who answered that they would have gotten rid of the appliance in the absence of the program)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	20	8	7
Within one year of when the program took it	95%	100%	100%
More than a year later	5	--	--
Don't know/refused	--	--	--

Respondents who said they would have gotten rid of the appliance were asked how they would have disposed of it. Most of them said they would have taken it to a dump or put it out as trash—mentioned by 42% of the refrigerator group, 33% of the freezer group, and 50% of the dehumidifier group (Table 4-16). About one in ten (12%) in the refrigerator group, and more than one in four in the freezer (28%) and dehumidifier (30%) groups said they would have given away the appliance. About one in five in the refrigerator (19%) and freezer (22%) groups said they would have hired a hauler to take it away.

Table 4-16: Method of Disposal in Absence of the Program

(Base: Respondents that answered that they would have gotten rid of the appliance in the absence of the program)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	26	18	10
Taken it to a garbage dump or put out as trash	42%	33%	50%
Hired hauler to take it away	19	22	--
Given it away for free	12	28	30
Had a retail store pick it up	12	6	--
Recycled it	4	6	20
Sold it	8	6	--
Don't know/refused	4	--	--

4.7.2 Participant Perspectives – Appliance Replacement

When asked what she would have done in the absence of the program, the one Appliance Replacement respondent said she would have purchased appliances through a retail store and paid them to haul away the old refrigerators. She went on to remark that it usually cost her money to have an appliance hauled away.

4.8 Old Appliances

4.8.1 How Disposed

Participant Perspectives – Appliance Retirement

As shown in Table 4-17, when asked what they thought happens to the appliances after the units were removed from their homes, one in five respondents (20%) said that they did not know. About three out of five the respondents (51%) knew that the appliances were recycled and about one-quarter (26%) knew that hazardous materials within the appliances were disposed of. One in ten (10%) simply thought that the appliances were trashed.

Table 4-17: Disposition of Appliances
(multiple responses)

	All Respondents
<i>Sample size</i>	70
Appliance is recycled	60%
Hazardous materials (CFCs, refrigerants, Freon) within appliance are disposed of	26%
Appliance is trashed	10%
Appliance is sold for reuse	4%
Other	4%
Don't know/refused	20%

Participant Perspectives – Appliance Replacement

When asked what she thought happened to the appliances after the units were removed through the program, the Appliance Replacement respondent said she assumed it was recycled or otherwise put out of commission.

4.8.2 Characteristics of Old Appliances

Respondents who had a refrigerator removed were asked whether it had been their primary refrigerator, secondary refrigerator, or had not currently been in use (Table 4-18). Nearly three out of five respondents (56%) had been using the refrigerator as a spare. About two out of five (42%) respondents reported that it had been their primary refrigerator. Participants who had retired freezers or dehumidifiers were not asked this question.

Table 4-18: Use of Removed Refrigerators

	All Respondents
<i>Sample size</i>	36
Used as primary/main	42%
Used as secondary/spare	56
Not being used	3

When asked how old the appliance was before it was removed, over four out five respondents who had retired refrigerators (81%) and freezers (85%), and three out five respondents who had retired dehumidifiers said they were over ten years old, with about one in three (34%) reporting that it was over twenty years old (Table 4-19). In general, the freezers tended to be older than the refrigerators which, in turn, tended to be older than the dehumidifiers: nearly two-thirds of the freezers (64%), one-half of the refrigerators (50%), and one-third of the dehumidifiers were over twenty years old.

Table 4-19: Age of Removed Appliances

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	34	28	15
0 to 5 years old	0%	0%	13%
6 to 10 years old	19	7	13
11 to 15 years old	25	7	7
16 to 20 years old	6	14	20
More than 20 years old	50	64	33
Don't know/refused	--	7	13

The Appliance Replacement participant, who had replaced 24 refrigerators, indicated that the average age of the replaced refrigerators was around 19 or 20 years.

Respondents who had a secondary refrigerator removed were asked how long they had used it as a spare (Table 4-20). About two out of three said they had used it as a secondary refrigerator for five or fewer years (65%), one in four (25%) said they had used it as a secondary refrigerator for over ten years, and about one in seven (15%) had used it as a secondary refrigerator for over twenty years.

Table 4-20: Length of Use for Secondary Refrigerators

(Base: Respondents who removed secondary refrigerator)

	Respondents
<i>Sample size</i>	20
0-2 years	35%
3-5 years	30
6-10 years	5
11-15 years	5
16-20 years	--
>20 years	15
Don't know/refused	10

Respondents who had a non-primary refrigerator or a freezer or dehumidifier removed were asked how often in the year before it was picked up the appliance had been plugged in (Table 4-21). Around four out of five respondents in all groups (76% for refrigerators; 79% for freezers; and 80% for dehumidifiers) said the appliance had been plugged in all or most of the time. Note that 57% of respondents with refrigerators and 79% of respondents with freezers said it had been plugged in all the time, and 53% of respondents with dehumidifiers said it had been plugged in most of the time.

Table 4-21: Amount of Time Appliance was Plugged In

(Base: Respondents who had a secondary or unused refrigerator picked up)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	21	28	15
All the time	57%	79%	27%
Most of the time	19	--	53
Occasionally	19	11	13
Never	5	11	7

Respondents whose freezers or dehumidifiers had been plugged in at least occasionally were asked how long they had been using the appliance before it was removed (Table 4-22). More than two out of three respondents had been using the freezers (72%) for over ten years and nearly three out of five respondents had been using the dehumidifiers (57%) for over ten years.

Table 4-22: Length of Use for Freezer and Dehumidifier

(Base: Respondents who answered that the freezer and dehumidifier was plugged in at least occasionally)

	Freezers	Dehumidifiers
<i>Sample size</i>	25	14
0-2 years	12%	7%
3-5 years	8	7
6-10 years	8	14
11-15 years	20	7
16-20 years	28	36
>20 years	24	14
Don't know/refused	--	14

Respondents who had removed a refrigerator or freezer that was not being used were asked how long it had been unused when they decided to remove it. Only one respondent reported having not used a refrigerator for three months when they decided to remove it. Three respondents reported having not used a freezer—two respondents had not used it for three years and one had not used it for two years—when they decided to remove it. Only one respondent reported having not used a dehumidifier for two years when they decided to remove it.

One of the criteria for pick-up is that the unit is in working condition; if the unit is not plugged in when the pick-up service arrives for the pick-up, the crew is directed to plug it in to confirm that the unit runs. When asked about the condition of the appliance that had been removed, the vast majority of respondents with refrigerators (92%) and freezers (93%), and four out of five respondents with dehumidifiers (80%) reported that it had been in working condition. (Table 4-23)

Table 4-23: Condition of Appliances

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Yes	92%	93%	80%
Yes, but not that well	8	7	20

About two-fifths (39%) of the refrigerator group, two-thirds (68%) of the freezer group, and practically all (93%) of the dehumidifier group had kept their appliance in the basement. Within the refrigerator group, an equal proportion (39%) had kept the refrigerator in the basement and the kitchen (Table 4-24). Nearly all of the respondents who had kept the refrigerator in the kitchen had previously reported that the removed appliance was their primary fridge (see Table 4-18).

Table 4-24: Location of Removed Refrigerator

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Basement	39%	68%	93%
Kitchen	39	16	--
Garage or shed	14	4	--
Porch	3	4	--
Laundry room	3	8	--
Yard	--	--	--
Other room in house	3	--	7
Some other place	--	--	--
Don't know/refused	--	--	--

About four out of five respondents in the refrigerator group (78%) and the freezer group (80%) had kept the appliance in a space that was heated in the winter. Likewise, around three out of five respondents in the refrigerator group (56%) and the freezer group (64%) had kept the appliance in a space that was cooled in the summer. (Table 4-25)

Table 4-25: Space Heating/Cooling in Location of Removed Appliance

	Refrigerators	Freezers
<i>Sample size</i>	36	28
Heated by heating system in the winter	78%	80%
Cooled with air conditioning in the summer	56%	64%

The survey asked respondents to report any drawbacks they had experienced from removing the appliance through the program (Table 4-26). The vast majority (91%) said they had experienced no drawbacks. It is interesting to note that very few respondents (1%) mentioned the potential drawback of knowing that their usable appliance was thrown away.

Table 4-26: Program Drawbacks

	All Respondents
<i>Sample size</i>	70
No drawbacks	91%
Loss of food storage space	4%
Usable appliances are thrown away	1%
Other	3%
Don't know/refused	1%

4.9 Appliance Replacement Behaviors

Respondents to the survey of Appliance Retirement participants were asked a series of questions regarding replacement of the appliances that they decided to recycle through the program.

Approximately one-half of the respondents who removed a refrigerator (56%) or freezer (50%) and three-quarters of those who removed a dehumidifier (73%), replaced the appliance with another appliance of the same type after it had been picked up by the program. (Table 4-27)

Table 4-27: Replacement of Appliances

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
Yes	56%	50%	73%
No	44	50	27

Nearly all of the replacement refrigerators (95%), most of the replacement freezers (86%), and three out of four dehumidifiers (71%) were new rather than used appliances (Table 4-28). Note that two out of the seven respondents who had replaced dehumidifiers did not say whether they were new or used.

Table 4-28: Replacement Appliance: New or Used

(Base: Respondents who replaced appliances turned in through the program)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	20	14	7
New	95%	86%	71%
Used	5	14	0
Don't know/refused	1	0	29

One-half (50%) of the replacement refrigerators, one-third of the replacement freezers (36%) and three out of seven dehumidifiers (43%) were bought at Sears. Other retailers from whom both freezers and dehumidifiers were purchased included both Costco and Canadian Tire.

Table 4-29: Where Replacement Appliance was Purchased

(Base: Respondents that replaced appliances turned in through the program)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	20	14	7
Sears	50%	36%	43%
Costco	0	14	14
Canadian Tire	0	7	29
Friend/relative	5	21	0
Home Depot	5	0	0
Other	40	21	0
Don't know/refused	0	0	14

A majority of the replacement appliances—95% of refrigerators, 86% of freezers, and 71% of dehumidifiers—were ENERGY STAR labeled appliances. (Table 4-30)

Table 4-30: Replacement Appliances with ENERGY STAR Label

(Base: respondents who replaced appliances turned in through the program)

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	20	14	7
Yes	95%	86%	71%
No	5	7	14
Don't know	0	7	14

4.10 Importance of a Secondary Appliance

Respondents with a secondary refrigerator or a freezer were asked how important it was to have a spare fridge or freezer for storing food and beverages on a scale from zero “not at all necessary” to ten (“absolutely necessary”) (Table 4-31). The responses of the two groups exhibited somewhat divergent opinions on the perceived importance of each appliance type: about two out three respondents (65%) who had removed a spare refrigerator thought it was not necessary (gave a rating of zero to four), while over one-half of the respondents (56%) who had removed a freezer thought it was necessary (gave a rating of six to ten). Overall, freezers (mean rating of 6.4) were judged to be more important than spare refrigerators (mean rating of 3.9).

Table 4-31: Importance of Secondary Refrigerator and Freezer
(Base: Respondents with secondary fridges or who removed a freezer)

	Refrigerators	Freezers
<i>Sample Size</i>	20	25
10 “Absolutely necessary”	15%	28%
9	--	8
8	5	8
7	5	12
6	--	--
5	10	8
4	10	4
3	10	16
2	5	4
1	35	0
0 “Not at all necessary”	5	8
Don’t know/refused	--	4
Average	3.9	6.4

4.10.1 Appliances Remaining in Home

Respondents were asked how many appliances were remaining in their home after they had turned in that type of appliance through the program. Among those that had removed a refrigerator, about four out of five (81%) had one remaining refrigerator. The freezer group was relatively evenly split with about one-half (46%) reporting no remaining stand-alone freezers and the same percentage (46%) reporting one remaining stand-alone freezer. In contrast, three-fifths of the dehumidifier group reported one remaining dehumidifier. This was not surprising considering Nova Scotia's humid climate. (Table 4-32)

Table 4-32: Appliances Remaining in Home after Program

	Refrigerators	Freezers	Dehumidifiers
<i>Sample size</i>	36	28	15
0	0%	46%	33%
1	81	46	60
2	16	7	7
3	3	0	0

Respondents with at least one remaining appliance of the type removed through the program were asked to give the age of the remaining appliances. For all of the appliances, note the steep drop in sample sizes between the first, second, and third units.

Among the primary refrigerators, three-quarters (75%) were five years old or less (Table 4-33); among the primary freezers, nearly nine out of ten were five years old or less (Table 4-34); and all of the primary dehumidifiers were five years old or less (Table 4-35).

Table 4-33: Age of Remaining Refrigerators

	First Refrigerator	Second Refrigerator	Third Refrigerator
<i>Sample size</i>	36	7	1
0 to 5 years old	75%	86%	100%
6 to 10 years old	17	14	--
11 to 15 years old	3	--	--
16 to 20 years old	6	--	--
More than 20 years old	--	--	--
Don't know/refused	--	--	--

Table 4-34: Age of Remaining Freezers

	First Freezer	Second Freezer
<i>Sample size</i>	15	2
0 to 5 years old	87%	50%
6 to 10 years old	7	--
11 to 15 years old	--	--
16 to 20 years old	--	--
More than 20 years old	7	50
Don't know/refused	--	--

Table 4-35: Age of Remaining Dehumidifiers

	First Dehumidifier	Second Dehumidifier
<i>Sample size</i>	10	1
0 to 5 years old	100%	100%
6 to 10 years old	--	--
11 to 15 years old	--	--
16 to 20 years old	--	--
More than 20 years old	--	--
Don't know/refused	--	--

4.11 Program Experience and Satisfaction

4.11.1 Participant Perspectives – Appliance Retirement

The survey asked participants about the impact of the program on their electricity usage and their satisfaction with the electricity savings they had seen since participating in the program. The survey also asked participants about any drawbacks to participation.

About one-half of the respondents could not tell if the program had had an impact on their electricity usage. About one-third (32%) reported a decrease in their electricity usage, while about one-sixth (16%) said that their usage had stayed about the same. (Table 4-36)

Table 4-36: Impact of Program on Electricity Usage

	All Respondents
<i>Sample size</i>	70
Decreased a lot	11%
Decreased a little	21
Stayed about the same	16
Increased a little	3
Increased a lot	1
Don't know/refused	47

The respondents who reported a decrease in their electricity usage were asked to rate their satisfaction with their electricity savings on a scale of one (“extremely dissatisfied”) to five (“extremely satisfied”). About three-fourths (74%) were satisfied and nearly one-half (48%) were extremely satisfied with their electricity savings. (Table 4-37)

Table 4-37: Satisfaction with Electricity Savings

	All Respondents
<i>Sample Size</i>	23
Mean	4.3
5 “Extremely satisfied”	48%
4	26
3	22
2	0
1 “Extremely dissatisfied”	0
Don't Know	4

4.11.2 Participant Perspectives – Appliance Replacement

During the in-depth interview, the Appliance Replacement participant was also asked about her experience and satisfaction with the program and to indicate any drawbacks to participation.

When asked to rate the program overall, she said she was neither satisfied nor dissatisfied with program (rated 3). She went on to comment that she was happy with the new refrigerators and their price. When asked to identify what aspects of the program had dissatisfied her, she identified two issues, both relating to payment for refrigerators. She reported that she had not known that she would not be able to use a credit card to pay for the refrigerators and would have to pay by cash or check. She was also dissatisfied with the time required for rebate processing: she indicated that it had taken over two months for the program to send her the rebate check.

4.11.3 Staff and Contractor Perspectives

According to in-depth interviews with staff and contractors, there were three main areas of customer dissatisfaction with the Appliance Retirement program.

- Complaints about the call center or call center staff
- Property damage during appliance removal
- Appliances covered by the program

Customer complaints about the call center or call center staff came directly to the the DSM Administrator who forwarded those to the program's call center for resolution. Complaints received about the call center included the inability to get through to a customer service representative, either due to volume or hours of operation, and complaints specific to individual call center staff.

Any property damage caused during the removal of appliances was handled directly by the pickup contractor. The implementation contractor received a total of five damage complaints and, in all cases, the customers were reimbursed. According to the implementation contractor, some customers complained that their other appliances (dryers, washing machines, etc.) were not eligible to be removed by the program.

4.12 Improvement Opportunities

4.12.1 Participant Perspectives – Appliance Retirement

Respondents were asked if they had any recommendations for improving the program (Table 4-38). Around two out of five respondents (44%) recommended some type of improvement. Most of the recommendations involved expanding the program in some way such as including more appliance types, offering the program for a longer period of time, and more advertising. Other respondents reported lack of professionalism of the pickup drivers such as not showing an ID or lack of adequate equipment.

Table 4-38: Recommendations for Improving Program in Future

Recommendation (multiple responses)	
<i>Sample size</i>	70
Accept a wider variety of products	9%
Better advertising/publicity	9%
Offer program for longer	7%
Improve pickups (e.g., professionalism of haulers, etc.)	7%
Issue rebate check sooner	4%
Improve scheduling (e.g., provide advance notice, etc.)	3%
Other	7%
No improvements needed	7%
No recommendations	56%

4.12.2 Participant Perspectives – Appliance Replacement

The one Appliance Replacement respondent gave only one suggestion for improving the program in the future. She suggested that the DSM Administrator publicize the program better. She went on to say that she had only heard about the program by chance.

4.12.3 Staff and Contractor Perspectives

When asked about program weaknesses and opportunities for improvement, program staff and contractors reported the following: limited geographic area, preparedness of call center, limited time of program, longer lead time, more clearly defined roles and responsibilities, bundling of smaller appliances, and understanding multi-family budget schedules better.

- Limited geographic area. As a pilot project, the program had been limited to the Cape Breton and Halifax regions. In addition to limiting the potential number of participants and thus potential energy savings, the limited region had also created potential for customer dissatisfaction. Some customers who had heard the radio advertisements may live outside the program area and would be unable to participate.
- Preparedness of call center. During initial program implementation, the call center was unprepared for the number of calls that were generated. In addition, the call center at the start

of the program had limited hours of operation, creating a problem for customers who had wished to register outside of regular office hours.

- Limited length of program. While the pilot program was necessarily limited to a short time period, a longer term program might have allowed for better scheduling of pickup times and the ability of contractors to hire long-term, higher quality staff.
- More clearly defined roles and responsibilities. Given the large number of organizations involved in the ARR program, it would be necessary to clearly define roles and responsibilities.
- Bundling of smaller appliances. Due to the cost of picking up appliances and the relatively lower savings, the program should only allow dehumidifiers and other small appliances to be collected if a refrigerator or a freezer is being removed by the program at the same time. By bundling appliances, the program would be able to keep costs down.
- Understanding multi-family budget schedules. It was clear from the pilot that working to get multi-family landlords and property managers into the program requires long lead times. A program that operates year-round and for multiple years would facilitate increased participation from the multi-family sector.

4.12.4 Coverage Gaps

Staff and contractors also identified the following gaps in coverage: window/room air conditioners and clothes washers and dryers.

- Window/room air conditioners. The pilot program did not allow for the removal of window or room air conditioners. Any future program may consider including air conditioners.
- Clothes washers and dryers. Some customers complained that they were unable to have clothes washers and dryers removed by the program.

4.13 Strengths and Successes

4.13.1 Staff and Contractor Perspectives

When asked about the program's greatest strengths and successes, program staff and contractors reported the following key strengths: ease of participation, incentives, precision of program, environmental benefits, economic benefits, good response with minimal marketing, and the speed of program design and implementation.

- Ease of participation. By allowing customers to enroll either online or over the phone, the program made the customer enrollment process very easy. This, coupled with the fact that the program removed appliances for participants, minimized potential barriers to participation.
- Incentives. While customers may have understood that older appliances were inefficient and wasted energy and money, they still believed their appliances to have intrinsic value. By offering an incentive, in effect, buying the appliances from the customers, the program sought to overcome another potential barrier.

- Precision of program. Participants in the ARR program were able to schedule their pickup and the pickup contractor was able to track each and every appliance collected through the use of PDAs in the field.
- Environmental benefits. In addition to energy savings that translate into reduction in emissions and demand savings that reduce the need for new plant construction, the ARR program also properly recycled and disposed of appliances collected through the program. The manufacture of new products from recycled material promoted a reduction in new resource use.
- Economic benefits. Customers receive not only an incentive for disposing of old appliances but also derive a long-term electric bill savings benefit from removing old and inefficient appliances from their homes.
- Minimal marketing. Relying solely on one round of direct mail advertising and four weeks of radio advertisements, the ARR program was able to generate sufficient interest to meet its goals.
- Speed of program design and implementation. All of the organizations involved in the ARR program worked together to design and implement a program in a short time period. Despite the quick turnaround required, the program was able to setup a system that allowed for the collection and recycling of appliances with a database system to track actions taken through the program.

5 Demographics & Firmographics

5.1 Appliance Retirement

The large majority of respondents lived in a single-family detached home that they own. (Table 5-1 and Table 5-2)

Table 5-1: Type of Home

	All Respondents
<i>Sample size</i>	70
Single-family detached house	89%
Semi-detached house	1
Single-family attached house (townhouse, row house, or duplex)	6
Apartment building with 2-4 units	3
Apartment building with 5 or more units	1
Mobile home or house trailer	0
Other [SPECIFY]	0
Don't know/refused	1

Table 5-2: Home Ownership

	All Respondents
<i>Sample size</i>	70
Own	91%
Rent/lease	7
Other	1
Don't know/refused	0

Nearly three-fifths of respondents (57%) had a house with three bedrooms and about one-quarter (23%) had house with have four bedrooms. (Table 5-3)

Table 5-3: Number of Bedrooms in Home

	All Respondents
<i>Sample size</i>	70
1	1%
2	9
3	57
4	23
5	4
6	4
7 or more	0
Don't know/refused	1

About three-fifths of the respondents (63%) had a college or university certificate or diploma and about one-fourth (23%) were high school graduates. (Table 5-4)

Table 5-4: Highest Level of Education

	All Respondents
<i>Sample size</i>	70
Less than high school graduate certificate	1%
High school graduate certificate and/or some post secondary education	23
Trade certificate/diploma	9
College certificate/diploma	19
University certificate/diploma	44
Don't know/refused	4

About two-fifths of the respondents (43%) lived in a two-person household and a similar percentage (41%) lived in a household with three or more people. (Table 5-5)

Table 5-5: Household Size

	All Respondents
<i>Sample size</i>	70
1	11%
2	43
3	20
4	14
5	4
6 or more	3
Don't know/refused	4

About two out three respondents were 45 years old or older. (Table 5-6)

Table 5-6: Age of Respondent

	All Respondents
<i>Sample size</i>	70
18 to 24	1%
25 to 34	13
35 to 44	13
45 to 54	27
55 to 64	14
65 or over	27
Don't know/refused	4

Nearly all the respondents (97%) paid their electric bills themselves. (Table 5-7)

Table 5-7: Method of Electric Bill Payment

	All Respondents
<i>Sample size</i>	70
Yes	97%
No	1
Don't know/refused	1

Practically all the respondents (96%) live in their home year round. (Table 5-8)

Table 5-8: Residency in Home

	All Respondents
<i>Sample size</i>	70
Year round residence	96%
Seasonal/vacation home	3
Don't Know/ Refused	1

About one-fourth of the respondents (27%) reported an annual household income under \$50,000 per year and over two-fifths reported an annual household income of \$50,000 per year or higher. About one-fourth (27%) of the respondents refused to answer the question. (Table 5-9)

Table 5-9: Household Income

	All Respondents
<i>Sample size</i>	70
\$14,999 or less	1%
\$15,000 to \$24,999	4
\$25,000 to \$34,999	9
\$35,000 to \$49,999	13
\$50,000 to \$69,999	14
\$70,000 to \$79,999	7
\$80,000 or more	24
Don't know/refused	27

The sample was almost evenly split between women and men. (Table 5-10)

Table 5-10: Gender

	All Respondents
<i>Sample size</i>	70
Female	56%
Male	44

5.2 Appliance Replacement

The company interviewed for the Appliance Replacement program owns one apartment building and manages 14 other apartment buildings. It has six employees and none of them have a specific responsibility for managing energy usage or energy efficiency.

Appendix A Interview Guides and Questionnaire

Participant Survey

2009-10 NSPI Appliance Retirement Program

DRAFT 8-11-10

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 _____ from NMR Group. I am calling on behalf of the Appliance Retirement program from Nova Scotia Power.

We are calling customers who used the program to remove and recycle refrigerators, freezers or dehumidifiers since June 2010. 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 turn-in 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.

Verification and Recall

V1. Our records indicate that your household participated in the Nova Scotia Power 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 sometime since June 2010. 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 AND TERMINATE]
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 AND TERMINATE.

V2 [ASK IF V1=3) Let me clarify, I am talking about the Nova Scotia Power 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, 9 = Don't Know]

1. Number of refrigerators picked up
2. Number of freezers picked up
3. Number of dehumidifiers picked up

V3. [IF V2 1 = YES] How many refrigerators were picked up through the Appliance Retirement program? [Record number, 98 (Don't Know) 99 Refused] _____

V4. [IF V2 2 = YES] How many stand-alone freezers were picked up through the Appliance Turn-in Program? [Record number, 98 (Don't Know) 99 Refused]_____

V5. [IF V2 3 = YES] How many dehumidifiers were picked up through the Appliance Retirement Program? [Record number, 98 (Don't Know) 99 Refused]_____

Program Information and Satisfaction [P series]

Now I would like to ask you some general questions about the Appliance turn-in program.

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 utility/Sponsor)
2. (Utility/Sponsor website)
3. (Utility/Sponsor 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)
97. (Other [SPECIFY _____])
98. (Don't know)
99. Refused)

P2. What do you think happens to appliances after they are picked up by the program? [DON'T READ; MULTIPLE RESPONSE]

1. (It gets recycled)
2. (They get rid of the CFCs, refrigerants, freon)
3. (They trash/get rid of it)
4. (They sell it to be reused)
97. (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.”]

P3. 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]

- P4. [IF P3 < 5] You indicated that you were dissatisfied with some aspect of the program. What are the main reasons you weren't satisfied? [DON'T READ; MULTIPLE RESPONSE]
- P5. 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)
- P6. Using a scale from 1 to 5 where 1 is "extremely easy" and 5 is "extremely difficult" how easy or difficult was it for you to...? [RANDOMIZE ORDER, ASKING A-C BASED ON SKIP PATTERNS]
- A. [IF P5=2 or 3] Fill out the sign-up form and sign up online
 - B. [IF P5=1 or 3] Call the program and sign up over the phone
 - C. [IF P5 GE 98] Sign up for the program
 - D. Schedule the time for the pickup
- P7A. [IF P6A < 5] Please describe any difficulties you had in signing up online.[MULTIPLE RESPONSE – RECORD VERBATIM]
- P7B. [IF P6B < 5] Please describe any difficulties you had in signing up over the phone.
[MULTIPLE RESPONSE – RECORD VERBATIM]
- P7C. [IF P6C < 5] Please describe any difficulties you had in signing up for the program.
[MULTIPLE RESPONSE – RECORD VERBATIM]
- P7D. [IF P6D < 5] Please describe any difficulties you had in scheduling the pick-up of your appliance(s).
[MULTIPLE RESPONSE – RECORD VERBATIM]
- P8. Please tell us if there is anything that could be done in the future to improve the program. (INTERVIEWER: CLARIFY RESPONSES AS NEEDED) [OPEN END, 96=NO RECOMMENDATIONS, 98=Don't know, 99=Refused]

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

REFRIGERATORS [R 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?']
- 99 (Refused)

RF3. [IF RF1=2 or 98 or 99] 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 USE?']
- 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 USE?']
- 99. (Refused)

RF5. Was the refrigerator in working condition when you decided to have it picked up by the program?

- 1. Yes
- 2. Yes, but not that well
- 3. No
- 98. (Don't know)
- 99. (Refused)

RF6. [IF RF1=2 or 3, OTHERWISE GO TO RF7] 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]
- 5. (Don't know) [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 located? [RANDOMIZE AND READ 1-5, THEN 97]

1. Basement
2. Kitchen
3. Garage
4. Porch
5. Laundry room
97. 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 the Nova Scotia Power 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

98. (Don't know)

99. (Refused)

RFR2. Why did you decide to get rid of the refrigerator through the Nova Scotia Power appliance retirement program? [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 refrigerator)

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)
16. (Save energy/electricity)

Other

97. (Other [SPECIFY_____])
98. (Don't know/Refused)

RFR3. Now I would like to ask you to consider what actions you would have taken in the absence of the Nova Scotia Power appliance retirement program. If the appliance retirement program had not been available to you, which of the following actions do you think you would have taken? Please select all that apply. Would you have....

[1 = YES, 2 = NO, 98 = Don't know, 99 = REFUSED]

RFR3a. Postponed getting rid of the refrigerator by more than one year

RFR3b. not have gotten rid of the refrigerator

RFR3c. have gotten rid of the refrigerator anyway

[ASK IF RFR3c=1 (Gotten rid of it)]

RFR4. If the Nova Scotia Power appliance retirement appliance turn-in program had **not** been available, how soon do you think you would have gotten rid of your refrigerator? Would you have gotten rid 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. **[SKIP IF RF3b = 1]** If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the refrigerator? Most likely, would you have: [RANDOMIZE AND READ 1-6, THEN 7, ALLOW ONLY ONE RESPONSE]

1. Sold it [GO TO RFR6]
2. Given it away for free [GO TO RFR7]
3. Taken it to a recycling center or hired someone to take it for recycling [GO TO RB1]
4. Taken it to a garbage dump or put out as trash [GO TO RB1]
5. Hired hauler to take it away [GO TO RB1]
6. Had a retail store come and pick it up [GO TO RB1]
7. Or would you have done something else? [SPECIFY]_____ [GO TO RB1]
98. (Don't know) [GO TO RB1]
99. (Refused) [GO TO RB1]

[ASK IF RFR5=1 (Sold it)]

RFR6. Would you have sold the refrigerator to a private party, to a used appliance dealer, or someone else?

1. Private party, such as a friend or family member
2. Used appliance dealer
3. Sold on an Internet site, such as Craig's List
4. Someone else, specify: _____
98. (Don't know)
99. (Refused)

[ASK IF RFR5=2 (Given it away for free)]

RFR7. Who would you have given the refrigerator to? Would you have: [READ; ALLOW ONLY ONE RESPONSE]

1. Given it to a private party, such as a friend or family member
2. Given it to a charity, such as Goodwill Industries or a church
3. Put it on the curb with a 'Free' sign on it
4. Given it away on an Internet site, such as Craig's List
5. Or would you have given it away some other way? [Specify] _____
98. (Don't know)
99. (Refused)

[ASK IF RFR3b=2 (Would keep)]

RFR8. If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the refrigerator? Most likely, would you have:

1. Continued to use it
2. Stored it unplugged
3. Or would you have done something else? [SPECIFY. IF RESPONSE INDICATES WOULD HAVE GOTTEN RID OF UNIT, GO BACK TO RFR3 AND CLARIFY RESPONSE, ASKING RFR4 THROUGH RFR7 IF NECESSARY]
98. (Don't know)
99. (Refused)

RFR9. Nova Scotia Power paid for the refrigerator to be removed from your home and recycled, approximately a \$60 value. If you had not received these services for free from Nova Scotia Power, could your budget have accommodated the full cost of recycling the refrigerator? Again, the approximate cost of removal and recycling would have been \$60.

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

RFR10. How influential were the following elements to your decision to participate in the Nova Scotia Power appliance retirement program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program had no influence at all on your decision to remove the refrigerator and 5 indicates that the program was extremely influential to your decision to remove the refrigerator. How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. \$35 incentive provided by Nova Scotia Power	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Removal and recycling services provided for free as part of the program	1 no influence	2	3	4	5 extremely influential	9 DK

RF11. If the Nova Scotia Power 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?']
99. (Refused)

Replacement Refrigerator (RE Series)

RE1. Did you replace the refrigerator that you turned in through the Nova Scotia Power appliance retirement program?

1. Yes
2. No [GO TO RRF1]
3. (Don't know) [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_____]
97. (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]_____ [RECORD NUMBER, 98 Don't know, 99 Refused] [IF 0 GO TO FZ1 (Freezer Series)].

RRF2a through RRF2c. [FOR EACH REFRIGERATOR, 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.]

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?']
99. (Refused)

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?']
99. (Refused)

FZ3. Was the freezer in working condition when you decided to have it picked up by the program?

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 USE?']
99. (Refused)

FZ5. [IF FZ1 NE 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 TIME OF USE?']
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 97]

1. Basement
2. Kitchen
3. Garage
4. Porch
5. Laundry room
97. 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 Nova Scotia Power 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

98. (Don't know)

99. (Refused)

FFR2. Why did you decide to get rid of the freezer through the Nova Scotia Power appliance retirement program? [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 freezer)

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)
16. (Save energy/electricity)

Other

97. (Other [SPECIFY_____])
98. (Don't know)
99. (Refused)

FFR3. Now I would like to ask you to consider what actions you would have taken in the absence of the Nova Scotia Power appliance retirement program. If the appliance retirement program had not been available to you, which of the following actions do you think you would have taken? Please select all that apply. Would you have.....

[1 = YES, 2 = NO, 98 = Don't know, 99 = REFUSED]

FFR3a. Postponed getting rid of the freezer by more than one year

FFR3b. not have gotten rid of the freezer

FFR3c. have gotten rid of the freezer anyway

[ASK IF FFR3c=1 (Gotten rid of it)]

FFR4. If the Nova Scotia Power appliance retirement program had **not** been available, how soon do you think you would have gotten rid of your freezer? Would you have gotten rid 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. **[IF FFR3b = 1 SKIP]** If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the freezer? Most likely, would you have: [RANDOMIZE AND READ 1-6, THEN 7, ALLOW ONLY ONE RESPONSE]

1. Sold it [GO TO FFR6]

2. Given it away for free [GO TO FFR6]

3. Taken it to a recycling center or hired someone to take it for recycling [GO TO FB1]

4. Taken it to a garbage dump or put out as trash [GO TO FB1]

5. Hired hauler to take it away [GO TO FB1]

6. Had a retail store come and pick it up [GO TO FB1]

7. Or would you have done something else? [SPECIFY]_____ [GO TO FB1]

98. (Don't know) [GO TO FB1]

99. (Refused) [GO TO FB1]

[ASK IF FFR5=1 (Sold it)]

FFR6. Would you have sold the freezer to a private party, to a used appliance dealer, or someone else?

1. Private party, such as a friend or family member

2. Used appliance dealer

3. Sold on an Internet site, such as Craig's List

4. Someone else, specify: _____

98. (Don't know)

99. (Refused)

[ASK IF FFR5=2 (Given it away for free)]

FFR7. Who would you have given the freezer to? Would you have: [READ; ALLOW ONLY ONE RESPONSE]

1. Given it to a private party, such as a friend or family member

2. Given it to a charity, such as Goodwill Industries or a church

3. Put it on the curb with a 'Free' sign on it

4. Given it away on an Internet site, such as Craig's List

5. Or would you have given it away some other way? [Specify] _____

98. (Don't know)

99. (Refused)

[ASK IF FFR3b=2 (Would keep)]

FFR8. If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the freezer? Most likely, would you have:

1. Continued to use it

2. Stored it unplugged

3. Or would you have done something else? [SPECIFY. IF RESPONSE INDICATES WOULD HAVE GOTTEN RID OF UNIT, GO BACK TO FFR3 AND CLARIFY RESPONSE, ASKING FFR4 THROUGH FFR7 IF NECESSARY]

98. (Don't know)

99. (Refused)

FFR9. Nova Scotia Power paid for the freezer to be removed from your home and recycled, approximately a \$60 value. If you had not received these services for free from Nova Scotia Power, could your budget have accommodated the full cost of recycling the freezer? Again, the approximate cost of removal and recycling would have been \$60.

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

FFR10. How influential were the following elements to your decision to participate in the Nova Scotia Power appliance retirement program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program had no influence at all on your decision to remove the freezer and 5 indicates that the program was extremely influential to your decision to remove the freezer. How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. \$35 incentive provided by Nova Scotia Power	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Removal and recycling services provided for free as part of the program	1 no influence	2	3	4	5 extremely influential	9 DK

FF11. If the Nova Scotia Power 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?']
99. (Refused)

Replacement Freezer Questions (FE Series)

FE1. Did you get another freezer to replace the one you turned in through the Nova Scotia Power appliance retirement program?

1. Yes
2. No [GO TO RFZ1]
98. (Don't know) [GO TO RFZ1]
99. (Refused)

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_____]
97. (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 FB3].

RBZ2a through RFZ2c. [FOR EACH FREEZER, 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.]

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?']
99. (Refused)

DEHUMIDIFIERS [DH SERIES]

[IF V1 = 1 and DH > 0 OR IF V5>0 (had dehumidifier removed) ASK DH SERIES, OTHERWISE SKIP TO SO1 (Spillover 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]:

- 5. All the time
- 6. Most of time
- 7. Occasionally
- 8. Never
- 100. (Don't know)
- 101. (Refused)

DH2. Approximately how old was the dehumidifier you had removed through the program? Was it [READ, CHECK ONE]:

- 6. 0 to 5 years old
- 7. 6 to 10 years old
- 8. 11 to 15 years old
- 9. 16 to 20 years old
- 10. More than 20 years old
- 100. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE AGE?']
- 101. (Refused)

DH3. Was the dehumidifier in working condition when you decided to have it picked up by the program?

- 4. Yes
- 5. Yes, but not that well
- 6. No
- 100. (Don't know)
- 101. (Refused)

DH4. [IF DH1 = 4 (Never used)] Approximately how long had the dehumidifier 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 USE?']
99. (Refused)

[IF DH1=4 GO TO DHR1-Dehumidifier Free-rider Series]

DH5. [IF DH1 NE 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? [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 TIME OF USE?']
99. (Refused)

DH7. Where in the house was the dehumidifier located? [RANDOMIZE AND READ 1-5, THEN 97]

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

DEHUMIDIFIER FREE-RIDERSHIP [DHR Series]

Please continue thinking about just that one dehumidifier.

DHR1. Had you *already* considered disposing of the dehumidifier *before* you heard about Nova Scotia Power 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
98. (Don't know)

99. (Refused)

DHR2. Why did you decide to get rid of the dehumidifier through the Nova Scotia Power appliance retirement program? [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 dehumidifier)

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)
16. (Save energy/electricity)

Other

97. (Other [SPECIFY _____])
98. (Don't know)
99. (Refused)

DHR3. Now I would like to ask you to consider what actions you would have taken in the absence of the Nova Scotia Power appliance retirement program. If the appliance retirement program had not been available to you, which of the following actions do you think you would have taken? Please select all that apply. Would you have.....

[1 = YES, 2 = NO, 98 = Don't know, 99 = REFUSED]

DHR3a. Postponed getting rid of the dehumidifier by more than one year

DHR3b. not have gotten rid of the dehumidifier

DHR3c. have gotten rid of the dehumidifier anyway

[ASK IF DHR3c=1 (Gotten rid of it)]

DHR4. If the Nova Scotia Power appliance retirement program had **not** been available, how soon do you think you would have gotten rid of your dehumidifier? Would you have gotten rid 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)

DHR5. If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the dehumidifier? Most likely, would you have:
[RANDOMIZE AND READ 1-6, THEN 7, ALLOW ONLY ONE RESPONSE]

1. Sold it [GO TO FFR6]

2. Given it away for free [GO TO FFR6]

3. Taken it to a recycling center or hired someone to take it for recycling [GO TO FB1]

4. Taken it to a garbage dump or put out as trash [GO TO FB1]

5. Hired hauler to take it away [GO TO FB1]

6. Had a retail store come and pick it up [GO TO FB1]

7. Or would you have done something else? [SPECIFY]_____ [GO TO FB1]

98. (Don't know) [GO TO FB1]

99. (Refused) [GO TO FB1]

[ASK IF DHR5=1 (Sold it)]

DHR6. Would you have sold the dehumidifier to a private party, to a used appliance dealer, or someone else?

1. Private party, such as a friend or family member

2. Used appliance dealer

3. Sold on an Internet site, such as Craig's List

4. Someone else, specify: _____

98. (Don't know)

99. (Refused)

[ASK IF DHR5=2 (Given it away for free)]

DHR7. Who would you have given the dehumidifier to? Would you have: [READ; ALLOW ONLY ONE RESPONSE]

1. Given it to a private party, such as a friend or family member
2. Given it to a charity, such as Goodwill Industries or a church
3. Put it on the curb with a 'Free' sign on it
4. Given it away on an Internet site, such as Craig's List
5. Or would you have given it away some other way? [Specify] _____

98. (Don't know)

99. (Refused)

[ASK IF DHR3b = 1 (Would keep)]

DHR8. If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the dehumidifier? Most likely, would you have:

1. Continued to use it
2. Stored it unplugged
3. Or would you have done something else? [SPECIFY. IF RESPONSE INDICATES WOULD HAVE GOTTEN RID OF UNIT, GO BACK TO FFR3 AND CLARIFY RESPONSE, ASKING FFR4 THROUGH FFR7 IF NECESSARY]

98. (Don't know)

99. (Refused)

DHR9. Nova Scotia Power paid for the dehumidifier to be removed from your home and recycled, approximately a \$60 value. If you had not received these services for free from Nova Scotia Power, could your budget have accommodated the full cost of recycling the dehumidifier? Again, the approximate cost of removal and recycling would have been \$60.

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

DHR10. How influential were the following elements to your decision to participate in the Nova Scotia Power appliance retirement program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program had no influence at all on your decision to remove the dehumidifier and 5 indicates that the program was extremely influential to your decision to remove the dehumidifier. How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. \$10 incentive provided by Nova Scotia Power	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Removal and recycling services provided for free as part of the program	1 no influence	2	3	4	5 extremely influential	9 DK

DHR11. If the Nova Scotia Power 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?']
99. (Refused)

Replacement Dehumidifier Questions (DHE Series)

DHE1. Did you get another dehumidifier to replace the one you turned in through the Nova Scotia Power appliance retirement program?

1. Yes
2. No [GO TO RFZ1]
98. (Don't know) [GO TO RFZ1]
99. (Refused)

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_____]
97. (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 FB3].

DHZ2a through RFZ2c. [FOR EACH DEHUMIDIFIER, 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.]

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?']
99. (Refused)

SPILOVER [SO Series]

SO7. Relative to the same time period last year, would you say that your electricity usage has decreased or increased since participating in the Appliance retirement program? Has it:

1. Decreased a lot
2. Decreased a little
3. Stayed about the same
4. Increased a little
5. Increased a lot
6. Too early to tell any change
98. (Don't know)
99. (Refused)

SO8. How satisfied are you with the electricity savings you have seen since participating in the Appliance retirement program? Please use a scale from 1 to 5 where 1 is "extremely dissatisfied" and 5 is "extremely satisfied."

SO9. What, if any, potential drawbacks 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)
97. (Other SPECIFY _____)
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 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)
6. Apartment building that has fewer than five stories
7. Apartment building that has five or more stories
8. Other [SPECIFY: _____]
9. (Don't know/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
3. (Don't Know/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 _____)
8. (DK/RF)

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? [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)
7. (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)
6. (Refused)

D9. Which of the following income categories best describes your total annual household income before taxes in 2009? 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
9. (Refused)

D10. [**DO NOT READ**] Gender

1. Male
2. Female

Staff and Contractor Interview Guide ARR, August 2010**Date:****Name:****Programs responsible for:****Introduction:****[This interview should take about an hour]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about your role with the program:**

1. How long have you been working on the Appliance Retirement program?
2. What is your specific role with the program?
3. What percent of your time do you spend on the program?
4. Who else do you interact with as part of the program? How frequently and regarding what aspects of the program?
5. Have these interactions gone smoothly?
6. What is the period of the program? When did it start? When will it end?
7. What are the 2010 energy savings goals for this program? Do you think you will achieve these goals?

Program Overall:

8. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program this year?
 - a. Again at the broadest level, what were the areas that were not so successful?
 - b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?
9. How successful have the marketing and promotional activities been? Are there some activities that have been more successful than others? Why?

Theory and Logic Model Review:

10. In general, how would you characterize the overall goals of the program—would you say that the program is primarily a Resource Acquisition program, where the focus is on delaying or displacing new power plant construction through demand reduction? Or would you say the program is primarily a Market Transformation program, where the focus is on changing practices and building adoption, and ultimately effect changes in NS provincial energy standards? Or is it a combination of the two? Why?
11. What do you think are the primary motivations for participating in the retail markdown program?
12. Are there any barriers to participation?
13. What are the short-term goals of program? [Probe: Try to think about goals other than the energy savings]
 - a. How do you think this program will affect the overall market in the short term? What is the mechanism by which this impact on the market will be achieved?
14. What are the intermediate goals of the program?
 - b. How do you think this program will affect the overall market in the intermediate term? What is the mechanism by which this impact on the market will be achieved?
15. What are the long-term goals of the program?
 - c. How do you think this program will affect the overall market in the long term? What is the mechanism by which this impact on the market will be achieved?
16. How do you expect to measure the extent to which program goals have been accomplished—that is, what are the indicators for the outcomes you expect to achieve? Short-term? Intermediate? Long-term?
 - a. Are there any key indicators or metrics to gauge program effectiveness and success in short-, intermediate-, and long-term?

Marketing, Participating Retailers, and Verification:

17. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
18. Overall, how successful has each program been so far? Why / Why not?
19. What do you think is particularly good about program delivery of each program? How could program delivery be improved?
20. Are there any safeguards to prevent free-ridership in the program? What are they?

21. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?

Strengths and Weaknesses / Wrap-up:

22. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
23. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
24. Are there any other program issues we have not discussed that you would like to mention?
25. We are planning on conducting interviews with [below] are there any other individuals or groups we should speak to about the program?
 - a. RECYCLING CONTRACTOR [NEED NAME]

Thank You

Transportation Company Guide for Appliance Retirement Program**Date:****Name:****Organization:****Introduction:****[This interview should take about 30 minutes]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:

We'd like to start by confirming a few things about yourself and your role with the program:

1. Please describe your responsibilities for the Appliance Retirement Program. Probe: did you work on the single family or multifamily components, or both?
2. What type of appliances have you picked up? How many of each type?
3. Does your business normally offer such appliance pick up services? IF NO: Have you previously offered such appliance pick up services?
4. What kind of training, guidance or instruction, if any, did [Name of the contractor] or Nova Scotia Power provide you?
5. Describe how you are paid for your work on the Appliance Retirement program. Are the payments timely? How might the reimbursement process be improved?
6. Is the program set up in a way that works for you and your business? What specifically works? What does not? How could the program be run better?
7. How many employees does your company have? How many of them do pick-ups and deliveries? How many people did you have working on this program? How many of them did pick-ups and deliveries?
8. Did you need to hire any new staff to work on this program? How many? Did you need to provide them with any training? How did that work out? What has happened to that staff now that the program is over?
9. What is the period of the program? When did it start? When will/did it end?

Program Coordination and Communications

10. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED: How frequent are you in contact with the program manager at

Nova Scotia Power? What is the nature of these interactions? How frequently are you in contact with the implementation contractor? What is the nature of these interactions?

11. What other organizations and individuals, do you interact with for this program? What is the nature of these interactions? How frequently are you in contact with them?
12. In general, have your interactions with all of these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?

Program Tracking and Reporting

13. Please describe the tracking and reporting data you provide for the Appliance Retirement Program. In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the Appliance Retirement Program is spent on fulfilling data tracking requirements?
14. In general, how well do you think the program tracking and reporting process is working? Do you believe all the necessary data is being captured and passed on to the implementation contractor? To Nova Scotia Power? If not, what data should be captured? Do you think the data is being captured and communicated in the most efficient possible way? IF NO: How could the data capture and communication be improved?
15. Are there any improvements you would like to see in the data tracking process that we have not already discussed? If yes, what are they?

Program Delivery Process

16. Please describe the program delivery process, starting with the customer's first contact with you. What is the timing for each step in the delivery process; for example, how long does it take to schedule the pickup, pick up the old appliance and deliver the new appliance, dispose of the old appliance? Do you do any follow-up after the new appliance has been installed and the old appliance taken away? What is the timing for that?
17. Are there any factors inhibit your ability to effectively perform any part of the program delivery process? IF YES: What are they? How can these be addressed? What impact do you think addressing them will have on your effectiveness and on the program overall?
18. In general, which parts of the program process do you think work particularly well? Why? Which parts work less well? Why?
19. Do you have any other suggestions for improving the program delivery process?

Customer Issues

20. Why do you think most customers participate in the program? What other reasons drive participation?

21. What keeps customers from participating in the program?
22. Have you received any complaints or other signs of customer dissatisfaction with the program? If yes, what was involved? If yes, how frequent is this?
23. How satisfied do you think customers are overall with the program? What feedback have you received from customers once the new appliances have been installed and the old appliances hauled away?

Strengths and Weaknesses / Wrap-up:

24. What would you say are the program's greatest strengths? And what would you say are the program's greatest weaknesses? What could be done to address these weaknesses?
25. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
26. Are there any other program issues we have not discussed that you would like to mention?

Multifamily Participant Discussion Guide
2009-10 NSPI Appliance Retirement Program
DRAFT 8-11-10

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 _____ from NMR Group. I am calling on behalf of the Appliance Retirement program from Nova Scotia Power.

We are calling customers who participated in the program to replace old, inefficient refrigerators with new refrigerators in multifamily residential buildings. Are you the person who was most involved and familiar with your building’s participation in the program?

[IF NO, ASK TO SPEAK TO THE APPROPRIATE PERSON: “May I please speak to the person who knows the most about your building’s participation in the program?”]

[IF APPROPRIATE PERSON] We are trying to speak customers about Nova Scotia Power’s appliance turn-in 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 interview will take about 15-20 minutes of your time.

Verification and Recall

V1. How many refrigerators were picked up and replaced through the Appliance Retirement Program?
[Record number, 98 (Don't Know) 99 Refused] _____?

V2. In how many buildings did the Appliance Retirement Program pick up and replace refrigerators?
[Record number, 98 (Don't Know) 99 Refused] _____

V3. IF MORE THAN ONE BUILDING: How many units did each building have? [Record number, 98 (Don't Know) 99 Refused] _____

V4. For each building, did the Appliance Retirement Program pick up and replace one refrigerator for each _____ unit?

V5A. IF NO: Were there some units where the program did not pick up and replace a refrigerator? Why not? Do those units have refrigerators? On average, how old are the refrigerators in those units?

V5B. IF NO: Were there some units where the program picked up and replaced more than one refrigerator? How is that?

Program Information and Satisfaction [P series]

Now I would like to ask you some general questions about the Appliance turn-in program.

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

Program Administrator Sources

- 9. (Bill insert/mailling from utility/Sponsor)
- 10. (Utility/Sponsor website)
- 11. (Utility/Sponsor advertising in newspaper, radio, TV)

Retailer Sources

- 12. (Appliance retailer/dealer)
- 13. (Store flyer)
- 14. (Salesperson)

Other Sources

- 15. (Co-worker, family, or friend)
- 16. (Internet—unspecified)
- 100. (Other [SPECIFY _____])
- 101. (Don't know)

102. Refused)

P2. What do you think happens to appliances after they are picked up by the program? [DON'T READ; MULTIPLE RESPONSE]

- 5. (It gets recycled)
- 6. (They get rid of the CFCs, refrigerants, freon)
- 7. (They trash/get rid of it)
- 8. (They sell it to be reused)
- 100. (Other [SPECIFY _____])
- 101. (Don't know)
- 102. (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."]

P3. 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]

P4. [IF P3 < 5] You indicated that you were dissatisfied with some aspect of the program. What are the main reasons you weren't satisfied? [DON'T READ; MULTIPLE RESPONSE]

P5. How did you initially sign up for the program?

- 4. (Over the phone)- e-mail
- 5. (Signed up online)
- 6. (Both)
- 7. (Other) _____
- 100. (Don't know)
- 101. (Refused)

P6A. Using a scale from 1 to 5 where 1 is "extremely easy" and 5 is "extremely difficult" how easy or difficult was the sign up process?

P6B. [IF P6A < 5] Please describe any difficulties you had in signing up online.[MULTIPLE RESPONSE – RECORD VERBATIM]

P7A. Using a scale from 1 to 5 where 1 is “extremely difficult” and 5 is “extremely easy” how easy or difficult was the process for scheduling the refrigerator pick up and replacement?

P7B. [IF P7A < 5] Please describe any difficulties you had in scheduling the pick-up and replacement of the refrigerators.

[MULTIPLE RESPONSE – RECORD VERBATIM]

P8. Is there anything that could be done in the future to improve the program. (INTERVIEWER: CLARIFY RESPONSES AS NEEDED) [OPEN END, 96=NO RECOMMENDATIONS, 98=Don’t know, 99=Refused]

REFRIGERATORS

RF1. On average, how old were the refrigerators that you had removed and replaced through the program? (IF MORE THAN ONE BUILDING, GET SEPARATE RESPONSE FOR EACH BUILDING)

98 (Don’t know) [PROBE: ‘CAN YOU GIVE AN APPROXIMATE AGE?’]

99 (Refused)

RF2. Is the space where the refrigerator was located heated in the winter?

3. Yes

4. No

100. (Don’t know)

101. (Refused)

RF3. Is the space where the refrigerator was located cooled in the summer?

3. Yes

4. No

100. (Don't know)

101. (Refused)

REFRIGERATOR FREE-RIDERSHIP SECTION [RFR Series]

RFR1. **Before** you heard about the Nova Scotia Power appliance retirement program, had you **already** considered replacing the refrigerators in your building?

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

RFR2. Why did you decide to replace the refrigerators through the Nova Scotia Power appliance retirement program? [DO NOT READ; MULTIPLE RESPONSE]

Age/Need

- 17. (Old units were not working well/Needed new units)

Building changes

- 18. (Remodeling/expanding building)

Financial

- 19. (Reduce energy/electricity costs)
- 20. (Rebate/incentive)
- 21. (Cost too much to buy new refrigerators)
- 22. (Cost too much to have the old refrigerators picked up)
- 23. (Did not want to pay disposal fee at dump/recycling center)
- 24. (Reduce maintenance costs/appliances needed repairs)

Logistical

- 25. (Easy/convenient to turn in the old refrigerator)
- 26. (They would pick it up)
- 27. (They would install the new refrigerator)
- 28. (Trash collection would not accept)

Energy/Environment

- 29. (Better for the environment)
- 30. (Wanted to recycle)
- 31. (Save energy/electricity)

Other

- 99. (Other [SPECIFY _____])
- 100. (Don't know/Refused)

RFR3. Now I would like to ask you to consider what actions you would have taken in the absence of the Nova Scotia Power appliance retirement program. If the appliance retirement program had not been

available to you, which of the following actions do you think you would have taken? Please select all that apply. Would you have....

[1 = YES, 2 = NO, 98 = Don't know, 99 = REFUSED]

RFR3a. Postponed replacing the refrigerators by more than one year

RFR3b. not have replaced the refrigerators

RFR3c. have replaced the refrigerators anyway

- Without the program would not have replaced them all at once

-

[ASK IF RFR3c=1 (Replaced it)]

RFR4. If the Nova Scotia Power appliance retirement appliance turn-in program had **not** been available, how soon do you think you would you have replaced your refrigerators? Would you have replaced them **within a year** of when the Program replaced it, **or more than a year later**?

1. Within a year of when the program replaced it

2. More than a year later

98. (Don't know)

99. (Refused)

- Probably would have only replaced 3 or 4 in the next year, not 24

RFR5. **[SKIP IF RFR3b = 1]** If the Nova Scotia Power appliance retirement program had not been available to you, what would you have done with the old refrigerators when the time came to replace them? Most likely, would you have: [RANDOMIZE AND READ 1-6, THEN 7, ALLOW ONLY ONE RESPONSE]

8. Sold them [GO TO RFR6]

9. Given them away for free [GO TO RFR7]

10. Hired someone to take them for recycling [GO TO RB1]

11. Have them taken them to a garbage dump or put out as trash [GO TO RB1]

12. Hired a hauler to take them away [GO TO RB1]

13. Had a retail store come and pick them up [GO TO RB1]

14. Replaced them haulers

15. Or would you have done something else? [SPECIFY]_____ [GO TO RB1]

100. (Don't know) [GO TO RB1]

101. (Refused) [GO TO RB1]

[ASK IF RFR5=1 (Sold them)]

RFR6. Where or to whom would you have sold the refrigerators?

1. Private party, such as a friend or family member
2. Used appliance dealer
3. Sold on an Internet site, such as Craig's List
4. Someone else, specify: _____
98. (Don't know)
99. (Refused)

[ASK IF RFR5=2 (Given them away for free)]

RFR7. Who would you have given the refrigerator to? Would you have: [READ; ALLOW ONLY ONE RESPONSE]

1. Given them to a charity, such as Goodwill Industries or a church
2. Given them away on an Internet site, such as Craig's List
3. Or would you have given it away some other way? [Specify] _____
98. (Don't know)
99. (Refused)

RFR9. Nova Scotia Power provided an incentive of \$XXX toward the purchase of new ENERGY STAR refrigerators. Additionally, Nova Scotia Power arranged for the removal and recycling of the old refrigerators, approximately a \$60 value per refrigerator. If you had not received these refrigerator purchase incentives and free recycling services from Nova Scotia Power, could your budget have accommodated the full cost of purchasing the new ENERGY STAR refrigerators and recycling the old refrigerators?

3. Yes
4. No
100. (Don't know)
101. (Refused)

RFR10. How influential were the following elements to your decision to participate in the Nova Scotia Power appliance retirement program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program had no influence at all on your decision to remove the refrigerator and 5 indicates that the program was extremely influential to your decision to remove the refrigerator. How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. \$XXX incentive provided by Nova Scotia Power toward the purchase of the new refrigerator	1 no influence	2	3	4	5 extremely influential	9 DK

b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Removal and recycling services provided for free as part of the program	1 no influence	2	3	4	5 extremely influential	9 DK

RF11. If the Nova Scotia Power 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?

3. \$0—Would not pay any amount

4. [RECORD DOLLARS \$1 to \$999] \$_____

100. (Don't know) [PROBE: 'CAN YOU GIVE AN APPROXIMATE ESTIMATE OF HOW MUCH YOU WOULD PAY?']

101. (Refused)

SPILOVER [SO Series]

SO6A. Has your participation in the Multifamily Appliance Replacement program influenced you to take any other actions to save energy in your building(s)? What are they?

SO6B. As a result of your participation in the Multifamily Appliance Replacement program, are you planning to take any other actions to save energy in your building(s)? What are they? When do you plan to take those actions?

SO7. Relative to the same time period last year, would you say that your electricity usage has decreased or increased since participating in the Appliance retirement program? Has it:

7. Decreased a lot

8. Decreased a little

9. Stayed about the same

10. Increased a little

11. Increased a lot

12. Too early to tell any change

100. (Don't know)

101. (Refused)

SO8. How satisfied are you with the electricity savings you have seen since participating in the Appliance retirement program? Please use a scale from 1 to 5 where 1 is "extremely dissatisfied" and 5 is "extremely satisfied."

SO9. What, if any, potential drawbacks have you experienced from removing your appliances through the Appliance retirement program? [DON'T READ, PROBE; MULTIPLE RESPONSE]

- 7. (No drawbacks)
- 8. (Loss of food storage space)
- 9. (Loss of other storage space)
- 10. (House no longer cool)
- 11. (House more humid)
- 12. (Usable appliances are thrown away)
- 100. (Other SPECIFY _____)
- 101. (Don't know)
- 102. (Refused) NO

FIRMOGRAPHICS

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

Staff Interview Guide for Appliance Retirement Program**Date:****Name:****Organization:****Introduction:****[This interview should take about 30 minutes]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about yourself and your role with the program:**

1. Please describe the subcontractor's responsibilities for the Appliance Retirement Program.
2. How long have you been working on the Appliance Retirement program?
3. What is your specific role with the program?
4. What percent of your time do you spend on the program?
5. What kind of training, if any, did the implementation contractor or Nova Scotia Power provide you?
 - No training, implementation contractor and subcontractor worked together to develop the program
 - Asked for feedback from implementation contractor, NSP and the retailer on the Multi-Res program – all approved of it the way the subcontractor developed it.
6. Does the subcontractor have specific goals for the 2010 Appliance Retirement program? What are they? [PROBE IF NOT MENTIONED; are there also any energy savings goals? IF NOT MENTIONED; are there also any participant goals?] Do you think you will achieve these goals? Why? Why not?
7. Describe how you are paid for your work on the Appliance Retirement program. Are the payments timely? How might the reimbursement process be improved?
8. Is the program set up in a way that works for you and your business? What specifically works? What does not? How could the program be run better?
9. What is the period of the program? When did it start? When will/did it end?
10. What do you see as the main goals of the Appliance Retirement Program?
11. What are the 2010 energy savings goals for this program? Do you think you will achieve these goals?

Program Coordination and Communications

12. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED: How frequent are you in contact with the program manager at Nova Scotia Power? What is the nature of these interactions? How frequently are you in contact with the implementation contractor? What is the nature of these interactions?
13. How many vendors or suppliers do you deal with for the Appliance Retirement Program? (IF 5 OR FEWER: What are their names?(Probe for [Name of recycler], [Name of pick-up service], [Name of Retailer]) What is the nature of these interactions? How frequently are you in contact with them?
14. What other organizations and individuals, do you interact with for this program? What is the nature of these interactions? How frequently are you in contact with them?
15. In general, have your interactions with all of these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?

Program Tracking and Reporting

16. Please describe the tracking and reporting data you provide for the Appliance Retirement Program. In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the Appliance Retirement Program is spent on fulfilling data tracking requirements?
17. In general, how well do you think the program tracking and reporting process is working? Do you believe all the necessary data is being captured and passed on to the implementation contractor? To Nova Scotia Power? If not, what data should be captured? Do you think the data is being captured and communicated in the most efficient possible way? IF NO: How could the data capture and communication be improved?
18. Are there any improvements you would like to see in the data tracking process that we have not already discussed? If yes, what are they?

Program Delivery Process

19. Please describe the program delivery process, starting with the customer's first contact with you. What is the timing for each step in the delivery process.
For example, how long does it take to schedule the pick up, pick up the old appliance and deliver the new appliance, dispose off the old appliance? Do you do any follow-up after the new appliance has been installed and the old appliance taken away? What is the timing for that?

20. Are there any factors inhibit your ability to effectively perform any part of the program delivery process? IF YES: What are they? How can these be addressed? What impact do you think addressing them will have on your effectiveness and on the program overall?
21. In general, which parts of the program process do you think work particularly well? Why? Which parts work less well? Why?
22. Do you have any other suggestions for improving the program delivery process?

Customer Issues

23. In general, how aware and knowledgeable are consumers in your service territory about the Appliance Retirement program? How important do you think it is to increase consumer awareness levels about the Appliance Retirement program? Why do you feel this way? What do you think should be done to increase consumer awareness levels? What do you think are the key messages to communicate regarding the program?
24. Have you done any outreach to identify potential customers? (Probe for call center work for SF and MF). How does this work?
25. Are there any customer segments who have really low participation in the program? Why? Are there any geographic areas where there is low program participation? Why?
26. Why do you think most customers participate in the program? What other reasons drive participation? What was the exact incentive amount paid for the purchase of the new refrigerators? [IF VARIES BY CUSTOMER, CHECK FOR EACH MF CUSTOMER ON LIST] What is the approximate cost for the removal and recycling of the old refrigerators?
27. What keeps customers from participating in the program?
28. Have you received any complaints or other signs of customer dissatisfaction with the program? If yes, what was involved? If yes, how frequent is this?
29. How satisfied do you think customers are overall with the program? What feedback have you received from customers once the new appliances have been installed and the old appliances hauled away?
 - Multi Res Program: Customers have requested for different sized fridges that were not available through the program this year; of the few that asked for a different size, most wanted a smaller fridge but there is no energy star model that is smaller than the one offered. There were only a handful of requests for a larger fridge.

Strengths and Weaknesses / Wrap-up:

30. What would you say are the program's greatest strengths? And what would you say are the program's greatest weaknesses? What could be done to address these weaknesses?
31. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
32. Are there any other program issues we have not discussed that you would like to mention?



Impact and Process Evaluation: Existing Houses Program 2010

February 25, 2011

Final Report

Submitted to:

Efficiency Nova Scotia Corporation

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Executive Summary

This report presents the results of the 2010 impact and process evaluation of the EnerGuide for Existing Houses (EEH) program conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation. The process evaluation was based on in-depth interviews with DSM Administrator staff, Conserve Nova Scotia (CNS) staff and program contractors, as well as telephone surveys with program participants. The interviews conducted with program staff and contractors covered a variety of program topics including goals, theory, structure, design, delivery, outreach and marketing.

Impact Evaluation Findings

The impact evaluation drew upon the program tracking records and HOT2000 pre- and post-retrofit reports. The NMR team's approach to assessing the impacts of the EEH program was to acquire and examine a sample of HOT2000 reports of participating homes to calculate the impact of the program.¹ Based on this evaluation, the NMR team estimates that the generator-level impacts for EEH in 2010 were 8,138 MWh of energy savings and 2,174 kW of demand savings. These evaluated program savings substantially exceeded the program's goal of 4,930 MWh of energy savings and 1,410 kW of demand savings (Table 1).

Table 1: 2010 Program Energy Savings

	Peak Demand (kW)	Energy (MWh)
Gross savings at generator	2,861	10,708
Net-to-Gross Ratio (%)	76%	76%
Net annual savings at generator	2,174	8,138

¹ Note that this impact evaluation presents the total impacts for electrically heated homes in the EEH program based on changes between pre-retrofit and post-retrofit EnerGuide ratings, reflecting the combined impacts of all electric and non-electric measures implemented. The EEH program receives funding from multiple agencies including Natural Resources Canada, Conserve Nova Scotia and the DSM Administrator. To the extent that Natural Resources Canada in particular is claiming energy savings associated with electric measures there may be potential for double counting of claimed savings.

Findings and Recommendations

The EnerGuide for Existing Homes program has been somewhat confusing for potential participants since the withdrawal of the rebates from NRCan in March 2010. In March, 2010 NRCan announced that new participants would not be eligible for federal rebates, which coincided closely with the announcement of the transition of administration of the DSM programs from NSPI to Efficiency Nova Scotia Corporation. This led to misperception among customers and potential participants that the program had ended.

Notwithstanding these issues, the program substantially exceeded its energy and demand savings goals. The 2010 DSM plan showed the EEH program goal to be 4,930 MWh of energy savings and 1,410 kW of demand savings. The evaluated savings for the 2010 EEH program were determined to be 8,138 MWh of energy savings and 2,174 kW of demand savings at the generator.

However, the EEH program is faced with uncertainty about whether or not it will continue past March 31st 2011. As a result of all of these program issues and concerns, most of the Delivery Agents had to lay off staff and therefore the EEH program delivery infrastructure has been affected.

In the 2009 evaluation, NMR had remarked on the planned exit of NRCan from the program on March 31st, 2011. NMR had commented on the importance of the Delivery Agents and that, regardless of the future of the EEH program, the DSM Administrator should consider reinforcing its relationship with the Delivery Agents. NMR noted that the Delivery Agents were a program asset that the DSM Administrator needed to nurture in the interest of maintaining an infrastructure to promote energy efficiency in the province. NRCan's withdrawal of rebates from the program (for future participants) precipitated events that may require the DSM Administrator to regain the trust and confidence of Delivery Agents and to rebuild the program delivery infrastructure.

While an assessment of market potential is beyond the scope of this evaluation, even a cursory review of statistics from NRCan suggest that there are likely substantial opportunities for an existing home retrofit program such as EEH. According to the Comprehensive Energy Use Database from the Natural Resources Canada Office of Energy Efficiency,² in 2008, there were 412,300 residences in Nova Scotia of which 276,900 were single family detached houses.

- One-half of these residences (50%) had been built before 1984 and about three-fourths (76%) had been built before 1996. These are older buildings that are likely to offer substantial opportunities for energy savings through retrofits.
- One-third of these residences (33%) have space heating systems that are based entirely or partially on electricity, including over one-fifth that rely exclusively on electric baseboard heating (22%).
- About one-half of these residences (51%) have electricity-based domestic water heating systems.

The following recommendations are provided as guidance for any future existing home retrofit program in Nova Scotia.

² http://www.oe.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_res_ns.cfm

Program Design & Delivery

Findings	Recommendations
EEH-F1. When approaching program design the DSM Administrator should keep in mind that the Delivery Agents have had to lay off a substantial portion of their staff. Any future program would need to include a ramp up period to allow Delivery Agents to re-hire staff and train new staff.	EEH-R1. In the near term, the DSM Administrator should consider the possibility of incorporating Delivery Agents into their existing residential programs. The Delivery Agents constitute a valuable resource that could be used for program sales and marketing.
EEH-F2. During the in-depth interviews, Delivery Agents expressed the opinion that federal funding, which had been withdrawn by NRCAN, is necessary for the program to exist.	EEH-R2. Should there continue to be no federal funds forthcoming from NRCAN, the DSM Administrator should conduct a market potential study to gauge customer interest and program opportunity based on the level of funding available from sources within Nova Scotia, including the provincial government and Efficiency Nova Scotia Corporation. The results of this study may be valuable in helping convince Delivery Agents about the market opportunity and the value of working with the program.
EEH-F3. The program changes caused a lot of misunderstanding among Delivery Agents who were frustrated with the changes and didn't want to engage with the program until all the changes had been settled.	EEH-R3. The DSM Administrator will need to work to regain the trust and confidence of Delivery Agents. Elements that may help with that include convincing Delivery Agents about the market opportunity.
EEH-F4. The Delivery Agents' license with NRCAN for use of the HOT2000 software made it difficult for them to share participants' HOT2000 files with the Program Administrator or its evaluation contractor.	EEH-R4. Any future program should establish an agreement with NRCAN that would allow the Program Administrator and its evaluators to obtain participants' HOT2000 files. As NMR had recommended in its 2009 evaluation, the DSM Administrator should also coordinate with NRCAN to introduce a waiver form for participants to sign during the initial audit and the final audit. This form would allow the DSM Administrator access to customer contact information which would aid in program evaluations.
EEH-F5. The 2009 evaluation had found that the EEH program puts the full burden of contractor selection on the customer and does not offer any training for contractors who install the energy efficient equipment. In fact, based on their agreement with NRCAN, Delivery Agents were not permitted to provide homeowners with contractor referrals or other contact information.	EEH-R5. Any future program should consider creating a list of contractors who have been pre-approved to work with the EEH program. Pre-approved contractors should be certified in energy efficiency and in installing energy efficient equipment. Customers would still have a choice in contractor selection but would have a readily available list of qualified contractors to from which they can make their choice. ³

³ To protect the DSM Administrator from any liability issues, the list can include an appropriate disclaimer stating that it makes no representations or warranties regarding the work of listed contractors, that the listing should not be considered an endorsement of any contractor, and that the customer bears the entire responsibility for any arrangements made with the contractor and work performed by the contractor.

Program Design & Delivery (continued)

Findings	Recommendations
EEH-F6. The EEH program has both resource acquisition and market transformation goals. A pool of well trained contractors could be a first step in achieving the market transformation goals of the program. Contractor training ensures that energy efficiency measures are installed correctly; without proper training, contractors may not install equipment correctly and the savings opportunities may not be fully realized. In addition, contractors who have been educated to understand and trained to install energy efficient products will be more likely to recommend and offer energy efficient products and services to their clients, both within any future EEH program and outside of the program.	EEH-R6. In order to achieve its market transformation goals, any future program should consider offering training opportunities to trade allies and contractors. These training courses could be required pre-requisites to be added to the pre-approved contractor list and would serve to help create a well-trained and educated contractor pool throughout the province.

Program Marketing and Outreach

Findings	Recommendations
EEH-F7. NRCan's announced withdrawal of federal rebates in March 2010 coincided closely with the announcement of the transition of administration of DSM programs from NSPI to Efficiency Nova Scotia Corporation. This led to a widespread misperception among customers and potential participants that the program had ended. Additionally, Delivery Agents remarked that they did not have sufficient resources to conduct marketing activities for the program.	EEH-R7. A new program would have to work hard to build awareness and establish credibility with the public. The DSM Administrator would need to lead the appropriate marketing and outreach effort. While it should coordinate marketing activities with the Delivery Agents, the primary responsibility would need to be with the DSM Administrator.
EEH-F8. When participants were asked how they had learned about the program, two-fifths of participants in 2010 (40%) and nearly one-half of the participants in 2009 (48%) said that they had heard about the program through word-of-mouth. This was consistent with observations from the in-depth interviews—three out of four delivery agents said that most people hear about the program through word-of-mouth. Other ways that customers frequently mentioned finding out about the program were through the Internet (14%) and the newspaper (10%).	EEH-R8. Before word-of-mouth can become a significant source of program awareness for a new program, it would need to rely more heavily on standard marketing channels such as newspaper, television, radio and internet. NMR also recommends that a new program should increase public awareness through newsworthy activities such as home shows.
EEH-F9. Nearly one in three respondents reported that prior to the first audit, they had contacted a contractor about the electric space or water heating equipment that they later installed as part of the EEH program. One of the most important reasons mentioned for having homes evaluated by an Energy Advisor was that respondents had already been thinking about energy efficient upgrades (24%).	EEH-R9. The new program should also seek to increase awareness through trade allies who customers might contact when thinking about energy efficient upgrades, e.g., contractors, hardware stores.
EEH-F10. Among the most important reason mentioned for having homes evaluated by an Energy Advisor were that respondents wanted to save on their energy bills (26%) and wanted to find out how energy efficient their home was (20%). Furthermore, nearly three out of five 2010 respondents (57%) reported a decrease in their energy bills since the installation of their upgrades.	EEH-R10. Promotions for the new program should emphasize to customers the opportunities to save on energy bills and to learn about the energy efficiency (or inefficiency) of their homes.

Program Marketing and Outreach (continued)

Findings	Recommendations
EEH-F11. Three out of four 2010 respondents (76%) mentioned at least one recommended measure that they had decided not to install. Of these respondents, the predominant reason for not installing a measure was that it was too expensive, which was mentioned by slightly under one-half of respondents (46%).	EEH-R11. The new program marketing materials should include the estimated life-time cost savings for measures offered by the program, adjusted based on the rebates and incentives available.
EEH-F12. About eight out of nine respondents (89%) had noticed a positive change in the comfort of their homes. They most frequently reported that temperatures were more even throughout their homes (71%) and that there were fewer drafts (29%) in their homes.	EEH-R12. Promotions for the new program should also include the non-energy benefits. It is possible that customers are unaware of the impact that program upgrades can have on the comfort levels in their homes.
EEH-F13. The Measure Effectiveness Index reveals that electronic thermostats, high efficiency air-to-air heat pumps with non-electric backup, electric water heater exposed pipe insulation, high efficiency ductless mini split heat pumps, and electric water heater tank insulation were particularly effective measures for the 2010 program. Conversely, the ETS measures—hot air furnace, room units, and central hydronic systems—were relatively ineffective measures for the 2010 program.	EEH-R13. When promoting and discussing the program with customers, program representatives should keep in mind the relative effectiveness of different measures in terms of uptake and cost per kWh of savings. Where possible, Delivery Agents should seek to focus on promoting the more effective measures such as electronic thermostats, high efficiency air-to-air heat pumps, electric water heater exposed pipe insulation, high efficiency ductless mini split heat pumps, and electric water heater tank insulation.

Program Performance and Savings

Findings	Recommendations
EEH-F14. NMR found that the program was double counting savings for a number of measures. Any of the five heat pump measures, solar hot water heaters, and water heater tank insulation all have the potential to be double counted by the program.	EEH-R14. The new program should remove the potential for double counting by applying prescriptive savings only to measures that either cannot be modeled in HOT2000, or have no impact on the EnerGuide rating and energy consumption of a HOT2000 model. Some measures meet these criteria: drain water heat recovery systems, programmable thermostats, and water heater pipe insulation. These measures have no impact on the EnerGuide rating or energy consumption of a HOT2000 model, and therefore cannot be double counted. We suggest that all other measures be modeled in HOT2000 and their savings be calculated through the EnerGuide point system, not through prescriptive savings estimates.
EEH-F15. There are different savings estimates for every prescriptive measure that is sponsored by the existing and new houses programs. Savings estimates vary only slightly for some measures and drastically for others. For example, water heater tank insulation had a similar savings estimate in both the existing and new houses programs (400 kWh vs. 399 kWh respectively), while programmable thermostats had significantly lower savings in the existing houses program (205 kWh) compared to the new houses program (643 kWh).	EEH-R15. The new program should consider coordinating with any new houses program to maintain consistency with regards to prescriptive savings estimates.
EEH-F16. It is unclear how the prescriptive savings estimates used by the program were developed in the tracking database.	EEH-R16. The new program should clearly identify how savings estimates are developed in the tracking database, and the assumptions that are used for the tracking data savings calculations. This would help evaluators determine the validity of the program's savings estimates.

1 Program Description and Data Tracking

The 2010 EnerGuide for Existing Houses (EEH) program was primarily administered by Conserve Nova Scotia (CNS) and encouraged homeowners in Nova Scotia to improve the energy efficiency of their houses.⁴ The EEH program initially worked in conjunction with Natural Resources Canada's (NRCAN) ecoENERGY Retrofit Homes program and the DSM administrator provided additional rebated measures for the program. However, in March 2010 NRCAN discontinued offering any rebates for newly enrolled participants in the program.⁵ Prior to NRCAN's exit, rebates were available to homeowners from the federal government (NRCAN), the provincial government (CNS), and the DSM Administrator. After NRCAN's exit, federal rebates were no longer available. The current end date for the program is March 31st 2011, and a decision has not been made as to whether or not the program will continue past that date. Participation in the program consists of three phases: a pre-retrofit evaluation, retrofit activities and a post-retrofit evaluation.

Pre-retrofit Evaluation

To participate in the program, homeowners must contact one of the ecoENERGY Delivery Agents in the province to schedule a pre-retrofit evaluation. For most homes, the cost of the pre-retrofit evaluation is \$150 plus tax.⁶ The pre-retrofit evaluation consists of a comprehensive audit of the house, including a blower door test to determine its air tightness. The evaluator also collects information such as insulation levels, type of doors and windows, and the types of heating and hot water systems. After visiting a home, the evaluator enters its data into NRCAN's HOT2000⁷ software and produces a customized report for each participant that assigns the house an EnerGuide rating and outlines the effectiveness of optional upgrades. The data is also uploaded to NRCAN for review and validation.

Retrofit Activities

After the pre-retrofit evaluation, homeowners have 18 months to complete any suggested upgrades and schedule a post-retrofit evaluation. For federal rebates they have up to 18 months or until March 31, 2011 (whichever comes sooner). Responsibility for completing the upgrades rests entirely with the homeowners. In fact, the Delivery Agents' agreements with NRCAN prohibit them from providing homeowners with contractor referrals.

Post-retrofit Evaluation

During the post-retrofit evaluation, the evaluator verifies the upgrades that have been completed, performs a blower door test, and assigns the house a final EnerGuide rating. After the post-retrofit evaluation, the homeowner becomes eligible for program rebates. Participants that registered for their pre-retrofit evaluation prior to March 31, 2010 are eligible for federal rebates up to \$5,000. All participants are also eligible for up to \$1,500 in provincial rebates as well as rebates from the DSM Administrator that

⁵ NRCAN still supports the program administratively. It has also committed to continue supporting HOT2000 and to perform quality assurance on uploaded files. It also continues to train and certify advisors.

⁶ There is an additional charge of \$25 per 500 sq. ft. for homes over 3,500 sq. ft., up to \$250.

⁷ HOT2000 is the software used by the EEH program to calculate savings and provide each of the participating homes with EnerGuide ratings.

vary depending upon the measures installed. For houses with electricity as its primary heating source, the DSM Administrator pays for all of the provincial government's share of the rebates. Additionally, the DSM Administrator provides eligible homeowners with rebates for completing specific approved electricity-related upgrades. Any existing residential home or small multi-unit residential building (MURB)⁸ is eligible to participate in the EnerGuide for Existing Houses program, but the DSM Administrator incentives are only available for homes with electric heating systems or electric hot water systems. There is no maximum rebate amount per household for electricity DSM rebates.

Incentives and Rebates

In addition to funding the provincial government's rebates for houses that have electric heating, the DSM Administrator's contribution to the EnerGuide for Existing Houses program covers the following DSM measures:

Table 1-1: EnerGuide Existing Houses Electric Incentives

Measure	2009	2010
	Incentive	Incentive
Houses with Electric Heating Systems		
High efficiency ductless air to air heat pumps with electric backup	NA	\$750*
High efficiency central ("ducted") air source heat pump with electric back up	\$900	\$900*
High efficiency ductless air to air heat pumps with non-electric backup	NA	\$1000*
High efficiency central ("ducted") air source heat pump with non electric backup	\$1200	\$1200*
High efficiency ground source heat pump	\$1,400	\$2500*
Electric thermal storage room units (up to four)	\$100 each	\$100 each
Electric thermal storage hot air furnace	\$500	\$500
Electric thermal storage central hydronic system	\$600	\$600
Electronic thermostats (up to 13)	\$10 each	\$15 each*
Houses with Electric Hot Water Heating		
Drain water heat recovery (42% efficiency or greater)	\$130	\$130*
Drain water heat recovery (30% efficiency to 41.9% efficiency)	\$75	\$75*
Solar domestic water heating system	\$1,250	\$1,250*
Electric water heater exposed copper pipe wrap of thermal resistance value R3 or higher (at least 10 feet)	NA	\$10
Aluminum foil or fiberglass electric water heater tank wrap	NA	\$25

* In accordance with the province of Nova Scotia's and Natural Resources Canada's existing criteria and eligible models

⁸ A small MURB is a building of 3 stories or less, with no more than 20 individual residences

1.1 Program Theory

Program Background

The 2010 EnerGuide for Existing Houses (EEH) program was primarily administered by Conserve Nova Scotia (CNS) and encouraged existing home owners in Nova Scotia to improve the energy efficiency of their houses. The EEH program is both a Market Transformation and a Resource Acquisition program. As a Market Transformation program, the EEH program's goal is to shift market adoption of energy efficient measures in existing homes and create a large and sustained market for energy efficient products and services. As a Resource Acquisition program, the EEH program's goal is to improve the energy efficiency of as many existing homes in Nova Scotia as possible. The 2010 EEH program worked in conjunction with Natural Resources Canada's (NRCan) EnerGuide rating service. As noted earlier, NRCan discontinued program rebates to new participants in March 2010, after which funding for the program came from the provincial government (CNS) and the DSM Administrator. Participation in the program consisted of three phases: pre-retrofit evaluation, retrofit activities and the post-retrofit evaluation.

Program Activities

- **Delivery Agent recruitment and training.** NRCan trains delivery agents and energy evaluators for the EnerGuide Existing Houses program.
- **Energy evaluator training.** Delivery agents hire and train energy evaluators.
- **Marketing and outreach.** Program sponsors engage in marketing activities to solicit participation.
- **Pre-retrofit evaluation.** Energy Evaluators conduct a pre-retrofit evaluation, including a comprehensive examination of each house, a blower door test and collection of information such as insulation levels, types of doors and windows and the types of heating and hot water systems. Energy Evaluators input pre-retrofit information into HOT2000 software and upload the data to NRCan. The Energy Evaluators prepare a pre-retrofit report that includes an initial EnerGuide rating and recommendations for energy saving upgrades for each participant.
- **Retrofit activities.** Homeowners engage in retrofit activities with or without the use of contractors.
- **Post-retrofit evaluation.** Energy Evaluators perform a second evaluation and verify the energy-saving measures that were installed. Energy Evaluators input post-retrofit data into HOT2000 software and upload the information to NRCan. The HOT2000 software assigns a final EnerGuide rating for the house and the homeowner becomes eligible for program rebates.
- **Rebate processing.** CNS invoices the DSM Administrator for applicable electricity measures and building envelope upgrades if electrically heated. CNS provides cheques to participants for CNS and DSM Administrator-funded measures; for participants that registered for their pre-retrofit evaluation prior to March 31, 2010, NRCan provides cheques for federal incentives.

Program Assumptions

- **Sufficient marketing and outreach.** EnerGuide Existing Houses marketing and outreach activities are sufficient to recruit adequate numbers of participants.
- **Adequate availability of energy evaluators.** There are a sufficient number of Delivery Agents to perform pre- and post-retrofit evaluation activities.

- **Skills and equipment.** Delivery Agents have the equipment, tools and skills required to complete evaluations of participating homes or they can contract for such services.
- **Understanding of savings.** Homeowners will understand the energy and financial savings that can be realized by the installation of measures recommended by Energy Evaluators.
- **Availability of materials and measures.** Homeowners have access to the equipment, tools and skills required to complete upgrades as part of the program or they can contract for such services.
- **Energy savings.** Participants will experience reduced energy consumption which will result in lower energy bills.

Program Barriers

- **Lack of awareness of the program.** Some customers may not be aware of the EEH program and the rebates available through the program. Some customers may also think that the program no longer exists as a result of NRCan's withdrawal of rebates from the program.
- **Lack of awareness of energy efficient measures.** Some customers or contractors may not be aware that more energy efficient materials and equipment exist.
- **Perceptions of quality.** Some homeowners may have doubts about the quality of recommended energy efficient measures.
- **Measure Costs and Incentives.** Homeowners may be reluctant to invest in energy efficient equipment because of the upfront costs or lack of confidence that the longer-term bill savings will pay for measures.
- **Availability of measures.** Access to more efficient heating systems, building envelope improvements, etc. is essential for homeowners to complete improvements.
- **Training.** Contractors have the proper training to correctly specify and install energy efficient measures and equipment. Without such contractor training, the measures might not be installed or the savings opportunity might not be fully realized.

Short-Term Outcomes

- **Participants learn the energy efficiency levels of their homes.** The pre-retrofit evaluations conducted by certified evaluators identify the overall EnerGuide rating and energy efficiency level of participants' homes.
- **Energy Evaluators identify energy saving opportunities.** The pre-retrofit report provided to customers identifies energy savings opportunities and informs participants about what they can do to decrease their energy costs.
- **Participants make decisions about which measures to install.** Based on the pre-retrofit report, participants decide which energy efficiency measures to install.
- **Participants install energy saving measures.** Participants increase the energy efficiency level of their homes by installing energy savings measures.
- **Participants receive rebates and incentives.** Energy Evaluators apply for and participants receive rebates for applicable energy efficiency measures.

Mid-Term Outcomes

- **Energy savings and bill reductions.** Energy savings result from the upgrades installed in homes.
- **Participants are more knowledgeable about energy efficiency.** The post-retrofit evaluation and the new energy-efficient equipment in their homes help to increase the understanding of energy efficiency among participants.

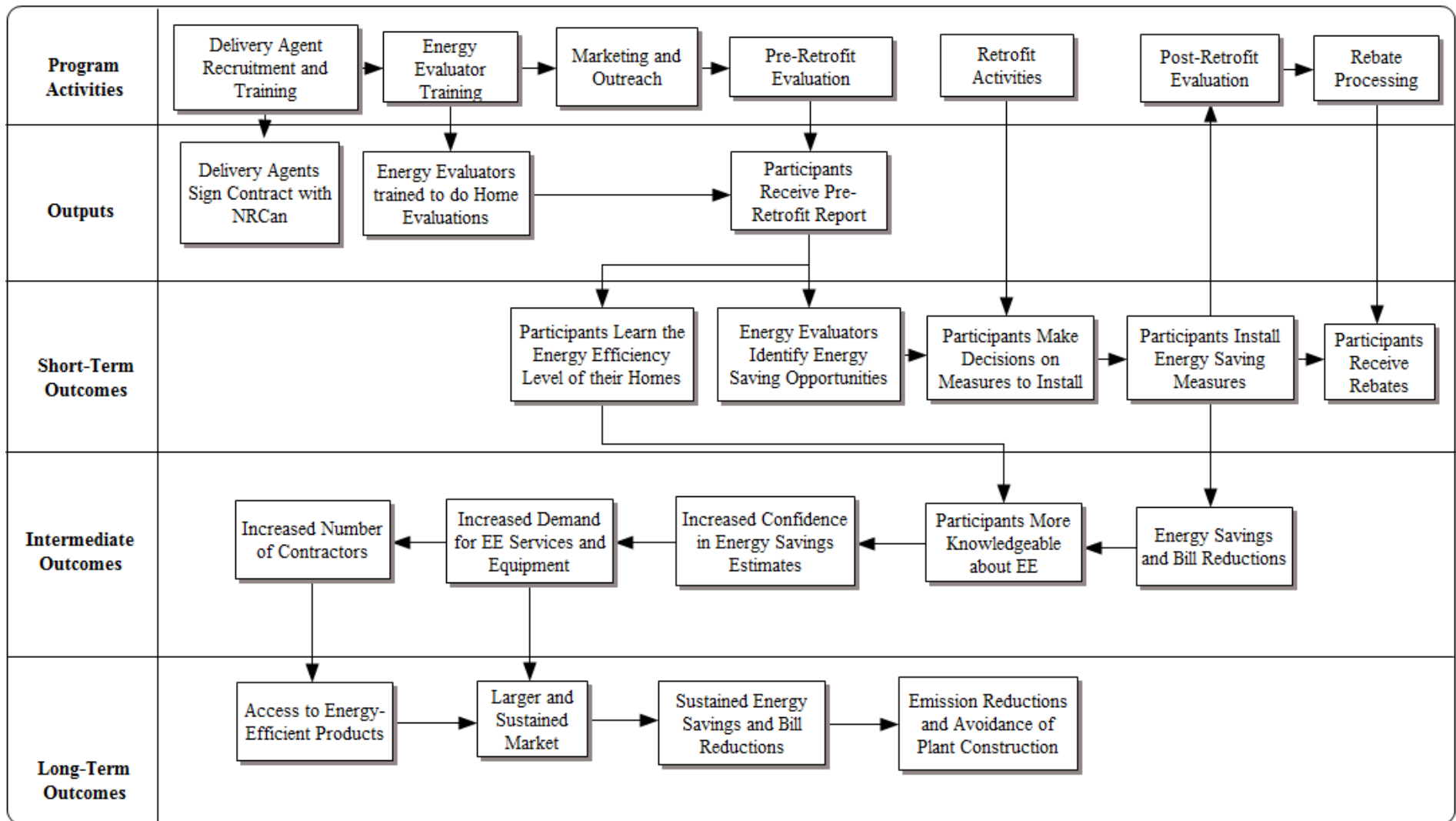
- **Confidence in energy savings estimates.** Based on their experience with the EEH program, homeowners will have confidence in energy savings estimates for energy efficiency improvements.
- **Increased demand for energy efficiency services and equipment.** Demand for energy efficiency products and services increases.
- **Increased number of contractors.** As the program matures, there will be an increased number of contractors with knowledge, experience and willingness to provide energy efficiency products and services to the residential sector.

Long-Term Outcomes

- **Access to energy-efficient products and services.** Due to an increased number of contractors, access to residential energy-efficient products and services is improved.
- **Energy efficiency becomes a standard consideration when purchasing equipment.** Increased access to equipment and services coupled with increased confidence in energy savings estimates results in energy efficiency becoming a standard part of homeowners' decision making processes.
- **Larger and sustained market.** A larger and more sustained market for energy-efficient products and services in the residential sector is created.
- **Sustained energy savings and bill reductions.** Homeowners experience sustained energy savings and lower energy bills as they continue to incorporate energy efficiency in their homes.
- **Emission reductions.** Energy savings translate into a reduction in emissions.
- **Avoidance of plant construction.** Demand and energy savings reduce the need for new generation.

1.2 Logic Model

Figure 1-1: EnerGuide Existing Houses Program Logic Model



2 Impact Evaluation

2.1 Methodology

The NMR team's approach to evaluating the 2010 impacts of the EEH program was based on a review of the program records to assess the approach taken by the DSM Administrator to calculate savings, adjust the calculations as necessary and develop a revised estimate of impacts.

We reviewed the pre-audit (D) and post-audit (E) files for a sample of 87 program homes. We calculated the difference in annual energy consumption between the pre- and post-audit files in order to develop a per EnerGuide point savings value that was unique to the existing houses program. The savings per EnerGuide point increase and the prescriptive savings value for program sponsored measures were applied to the program's tracking database to calculate the savings attributable to the EEH program in 2010.⁹ The evaluated impacts were compared with the tracking database impacts to assess the validity of the savings calculations currently utilized by the DSM Administrator.

2.2 Tracking Database Savings

According to the program's tracking database as of January 24, 2011, the 2010 EEH program had 1,516 participants eligible for electricity related rebates. The total tracked savings for 2010 participants was 9.72 GWh of energy savings at the meter and 10.88 GWh of energy savings at the generator. (Table 2-1)^{[10][11]} Generator savings were calculated by applying a line loss factor of 1.1188 to the meter savings.

Table 2-1: Tracking Database Savings—2010 Calendar Year

Total Savings	Meter	Generator
Energy Savings (GWh)	9.72	10.88

The tracking database savings were calculated using a combination of estimates of per EnerGuide point savings and prescriptive measure savings. The EnerGuide point savings were applied to the difference in EnerGuide ratings between the pre and post audits, and were meant to represent the savings from building envelope measures (e.g. insulation, air sealing, and windows) for electrically heated homes. The program used an annual savings value of 1,032.88 kWh per EnerGuide point, which was taken from the 2009 evaluation of the Low Income Houses program (LIH).¹² The prescriptive savings values were applied to all of the prescriptive measures rebated by the DSM Administrator. Table 2-2 shows each of the measures and the associated estimates of savings values.

⁹ Drain water heat recovery measures, programmable thermostats, and water pipe wrap insulation had prescriptive savings applied to all participants.

¹⁰ Early versions of the tracking spreadsheet contained only 793 participants, slightly more than one-half of the program's total participants. This error was fixed after NMR discovered a large portion of the sampled files could not be linked with the tracking data.

¹¹ NMR discovered an error in the program's tracking spreadsheet in which 265 participants had been excluded from the savings calculations. The values presented here are adjusted values and represent all of the 2010 program participants.

¹² NMR (2010) *Impact and Process Evaluation: Low Income Households Program 2009*. Submitted February 25, 2010

Table 2-2: Prescriptive Measures and Tracking Database Savings Values

Measures	Annual Savings (kWh)
Ground source heat pump	12,745
Ductless, mini-split air source heat pump	7,325
Air source heat pump without electric resistance backup	7,208
Air source heat pump with electric resistance backup	3,340
Solar domestic hot water heating system	2,112
Drain water heat recovery—42% efficient or greater	1,086
Drain water heat recovery—30% to 41.9% efficient	529
Water heater tank wrap insulation	400
Programmable electronic thermostat	205
Water heater pipe wrap insulation	122
Measures	Demand Savings (kW)
ETS forced air furnace	45
ETS central hydronic system	45
ETS room unit	10

The prescriptive savings were added to the EnerGuide point savings. The equation below gives an example of how savings would have been calculated for a project that had a D pre-audit EnerGuide rating of 50, an E post-audit EnerGuide rating of 60, and had a solar domestic hot water heating system installed.

$$[(60_{EG\ E\ audit} - 50_{EG\ D\ audit}) \times 1,032.88\ kWh] + 2,112\ kWh_{Solar} = 12,441\ kWh$$

According to the tracking data, the average D pre-audit EnerGuide rating was 65.17 and the average E post-audit EnerGuide rating was 71.50.¹³ Programmable thermostats were the most frequently installed prescriptive measure (1,909), followed by solar domestic hot water heaters (84), electric thermal storage (ETS) room units (68), and water heating pipe wrap insulation (66).¹⁴

2.3 Evaluated Program Impacts

2.3.1 EnerGuide Point Savings

The NMR team analyzed the pre- and post-audits from a sample of 87 participating projects in order to estimate savings per EnerGuide point that were unique to the EEH program. We extracted the overall annual energy consumption from both the pre- and post-audit files for each of the 87 projects that had been sampled; we subtracted the annual energy consumption for the post-audit from the annual energy consumption for the pre audit to assess the impacts of the program. These results were matched to the difference in EnerGuide ratings to calculate a value for the relationship between the EnerGuide point differential and the savings differential.

¹³ There were 156 projects in the tracking data that were missing a D audit EnerGuide rating.

¹⁴ On average, participants installed 1.26 programmable thermostats per home. This was reasonable as many of the homes that participated in the existing houses program were likely to have electric baseboard heat. Homes with electric baseboard heat often require more than one thermostat.

Eleven of the participating projects that were sampled had undergone a fuel switch, most often from heating oil to electric based heat. In all 11 cases, the participating project had converted their primary heating system from a non-electric furnace or boiler to an electric based heat pump. These types of fuel switches often increase the EnerGuide rating of the home as a heat pump offers increased efficiency compared to a non-electric furnace or boiler. While these projects may be more efficient, they also consume more electricity due to the fuel switch—resulting in negative savings for the program. According to the program manager, prior to May 1st, 2010 the program allowed oil-heated homes to collect rebates for installing heat pumps. After May 1st, 2010 the program no longer provided rebates for these types of fuel switches.¹⁵ For this reason, we concluded that the 11 projects in our sample that had undergone a fuel switch would be excluded from our EnerGuide point savings calculations.

Five additional projects were removed from our analysis because the tracking data did not have an EnerGuide rating listed for the D pre-audit and/or E post-audit. After removing these five projects, along with the 11 projects that had undergone a fuel switch, we were left with a total of 71 projects to conduct our EnerGuide point savings analysis. Table 2-3 displays a comparison of the 71 projects included in our EnerGuide point savings analysis and the rest of the program's projects. The sampled projects had a similar percentage of homes install each of the prescriptive measures as did the rest of the program's projects. The sampled projects had slightly higher D pre-audit and E post-audit ratings than the rest of the program. Having said that, the difference in EnerGuide point ratings between the pre- and post-audits was almost the same for the sampled projects (6.0) and the rest of the program's projects (6.2). These results suggest that the sampled projects reasonably represent the rest of the program.

Table 2-3: Comparison of Sampled Projects vs. Other Projects¹⁶

Measures	Sampled Projects	Other Projects
<i>Sample Size</i>	71	1,429
Programmable electronic thermostat	18%	17%
Solar hot water heater	3%	5%
Hot water heater tank wrap insulation	3%	3%
Hot water heater pipe wrap insulation	3%	3%
Air source heat pump with electric resistance backup	1%	3%
Air source heat pump without electric resistance backup	--*	2%*
ETS room unit	--*	2%*
Average D Audit EnerGuide rating	67.1	65.1
Average E Audit EnerGuide rating	73.1*	71.2*

*Indicates differences that are significant at the 90% confidence interval

For each project, we calculated the overall electricity savings between the pre- and post-audits and the difference in EnerGuide ratings. We summed the savings and EnerGuide point differences from all 71 projects, and then proceeded to divide the total savings by the total EnerGuide point difference to develop a per EnerGuide point savings estimate. In total, the 71 participating projects had a difference of 428 EnerGuide points between the pre- and post-audits, resulting in annual savings of 448,102 kWh. Dividing

¹⁵ According to the program manager, after May 1st, 2010 only homes that were either electrically heated or had electric hot water were eligible for program rebates.

¹⁶ Any measure not listed in this table was installed by less than 2% of participants.

the overall savings by the difference in EnerGuide ratings resulted in an evaluated per EnerGuide point savings estimate of 1,047 kWh. (Table 2-4)

Table 2-4: Evaluated per EnerGuide Point Savings

	Per EnerGuide Point Savings Data
<i>Sample Size</i>	71
Total EnerGuide rating point difference	428
Total savings—D and E audit difference (kWh)	448,102
Per EnerGuide point savings (kWh)	1,047

2.4 Prescriptive Savings

As previously mentioned, the total program savings listed in the program's tracking spreadsheet were calculated by adding the prescriptive savings values listed in Table 2-2 to a per EnerGuide point savings estimate that was meant to represent building envelope measures. Some of the program sponsored measures had the potential to be double counted by being modeled in HOT2000 and having a prescriptive savings value.¹⁷ If a measure was modeled in HOT2000 it likely increased the EnerGuide rating of the project, subsequently increasing the EnerGuide point savings; if that measure then had prescriptive savings applied to it, the benefits of the measure would be double counted: once in HOT2000, and once as a prescriptive measure. For example, if a participating home had a ground source heat pump installed, the EnerGuide rating for that home would increase substantially between the pre- and post-audits, in turn increasing the EnerGuide point savings for that home. If that home then had prescriptive savings for that same ground source heat pump added to the EnerGuide point savings, the measure would be double counted.

Because the potential exists for measures to be double counted, the NMR team determined that only four measures should have prescriptive savings; the rest of the measures would be captured in the 1,047 kWh that were applied to each EnerGuide point increase. The four measures that we determined should be added to the EnerGuide point savings were: the two drain water heat recovery measures, programmable thermostats, and water heater pipe wrap insulation. Each of the drain water heat recovery measures and programmable thermostats could be modeled in HOT2000, but including them in the model had no impact on the EnerGuide rating or energy consumption of the model, thus removing any possibility of double counting.¹⁸ Water heater pipe wrap insulation could not be modeled in HOT2000 so we assumed prescriptive savings should be applied to that measure as well.

¹⁷ HOT2000 is the software used by the EEH program to calculate savings and provide each of the participating homes with EnerGuide ratings.

¹⁸ NMR applied each of these measures to a HOT2000 model to determine what influence they had on the EnerGuide rating and energy consumption of the model. All four measures had no impact on the model.

2.5 2010 Program Impacts

To calculate the impacts of the 2010 existing houses program, the NMR team applied the evaluated EnerGuide point savings value of 1,047 kWh, and the prescriptive savings values for drain water heat recovery measures, programmable thermostats, and water heater pipe wrap insulation to the participants listed in the tracking spreadsheet.

Of the 1,516 projects that participated in the 2010 existing houses program, 156 did not have a D pre-audit EnerGuide rating listed in the tracking data. For these homes, we applied the average EnerGuide point difference (6.1 EnerGuide points) from all of the program projects that had both D pre-audit and E post-audit ratings in the tracking database.¹⁹ There were an additional 48 participants (of which 11 were represented in the sample) who had undergone a fuel switch. The NMR team removed any EnerGuide point savings for these participants, but applied the evaluated prescriptive savings for any water heating measures. The reason for this was that non-electric heating systems could have been paired with electric water heating systems, making such projects eligible for the rebates associated with water heating measures. (Table 2-5)²⁰

Table 2-5 displays the savings values used in the tracking database and those used in the evaluated calculations. Based on a review of the Ontario Power Authority's "2010 Prescriptive Measures and Assumptions" and the 2009 impact evaluation of the LIH program, the NMR team adjusted the prescriptive savings listed in the program's tracking database.^{[21][22]} We adjusted the savings values for programmable thermostats, solar hot water heaters, drain water heat recovery systems, water heater tank wrap insulation, and water heater pipe wrap insulation to reflect our secondary research and the prescriptive values used in the new houses program.

Table 2-5: Comparison of Prescriptive Savings

Measures	Tracked Savings (kWh)	Evaluated Savings (kWh)
Solar domestic hot water heating system	2,112	2,080*
Drain water heat recovery—42% efficient or greater	1,086	1,026
Drain water heat recovery—30% to 41.9% efficient	529	820
Water heater tank wrap insulation	400	399*
Programmable electronic thermostat	205	63 ²³
Water heater pipe wrap insulation	122	74

*Evaluated prescriptive savings only were applied to the 48 participants that underwent a fuel switch

Excepting the 48 participants who had undergone a fuel switch, all the other participants had the prescriptive savings values for drain water heat recovery measures, programmable thermostats, and water heater pipe insulation added to the per EnerGuide point savings of 1,047 kWh. (see Table 2-5) Table 2-6

¹⁹ The average D pre-audit rating was 65.2 and the average E post-audit rating was 71.3.

²⁰ The tracking database did not specify the water heating fuel type, so we assumed these homes had electric water heating systems.

²¹ http://www.powerauthority.on.ca/sites/default/files/page/16082_2010_Prescriptive_Measures_Assumptions_List_%28Feb_1_2010%29_%28Back_Up_Feb_01%29.pdf

²² NMR (2010). *Impact and Process Evaluation: Low Income Households Program 2009*. February 25, 2010.

²³ This is based on the Ontario Power Authority report. The OPA estimated savings of 63.15 kWh per electric baseboard. We applied this value to our evaluated savings estimates because the program only provides rebates for thermostats installed on electric baseboard heating systems.

displays a comparison of the tracked and evaluated savings for each measure and the EnerGuide point system. NMR estimated that the 2010 EEH program saved a total 9,571 MWh at the meter and 10,708 MWh at the generator. The tracking database had estimated savings of 9,723 MWh at the meter and 10,878 MWh at the generator—2% greater than the evaluated savings.

Table 2-6: Comparison of Detailed Tracking and Evaluated Savings Estimates

	Number of Projects	Tracking Savings Estimate (MWh)		Evaluated Savings Estimate (MWh)	
		Meter	Generator	Meter	Generator
EnerGuide rating	1,468 ²⁴	8,288	9,272	9,418	10,536
Programmable thermostat	255	391	438	120	135
Solar DHW	74	177	198	19*	21*
Tank wrap insulation	52	24	27	7*	8*
Pipe wrap insulation	51	8	9	5	5
ASHP with electric resistance backup	44	164	183	--	--
ASHP without electric resistance backup	30	252	282	--	--
Ground source heat pump	21	268	299	--	--
Ductless, mini-split ASHP	19	147	165	--	--
DWHR 42% or more efficient	3	3	4	3	3
DWHR 30% to 41.9% efficient	--	--	--	--	--
Total	1,516	9,723	10,878	9,571	10,708

*Evaluated prescriptive savings only were applied to the 48 participants that underwent a fuel switch

²⁴ The tracking database only calculated savings for 1,312 participants using the EnerGuide point system. The spreadsheet did not apply EnerGuide point savings to the 156 participants that were missing D pre-audit EnerGuide ratings.

The 2010 DSM plan showed the EEH program goal to be 4,930 MWh of energy savings and 1,410 kW of demand savings.²⁵ According to the program manual, the program aimed to achieve this goal through a targeted 2,700 participating projects. Our evaluation determined that there were 1,516 participating projects in the 2010 existing houses program, resulting in gross savings of 9,571 MWh at the meter and 10,708 MWh at the generator. The evaluated program savings were nearly double the program's targeted energy savings, accomplished with slightly over one-half of the anticipated number of projects.

NMR initially calculated the demand impacts for the existing houses program by obtaining the ratio of the program's target peak demand savings to target energy savings from the 2009 DSM targets per the UARB Approved Settlement Agreement. Based on an energy-to-demand ratio of 6.5 we developed initial demand savings estimates of 1,472 kW. We then calculated the demand saving for all ETS units installed through the program and added these savings to our initial estimates.²⁶ We found that the total demand savings from all ETS measures was 1,085 kW, resulting in total demand savings of 2,557 kW at the meter and 2,861 kW at the generator. (Table 2-7)

Table 2-7: Gross Savings

Total Savings	Evaluated Impact Savings Estimate	
	Meter	Generator
Participating homes	1,516	1,516
Total Savings (MWh)	9,571	10,708
Energy-to-demand ratio	6.5	6.5
Ratio demand savings (kW)	1,472	1,647
ETS demand savings (kW)	1,085	1,214
Total demand savings (kW)	2,557	2,861

²⁵ From 2010 DSM Plan Targets Revised Jan 26 2010.

²⁶ These estimates are based on the prescriptive savings values listed in the program's tracking data.

2.6 Free-ridership

In order to determine the extent of free-ridership, respondents were asked a series of questions related to their plans to pursue program measures before participating in the program as well as the influence and importance of the program on their decisions to install program measures. The free-ridership questions were divided into three general categories: program influence, stated intent, and screening/cross-check questions. (Table 2-8, Table 2-9, and Table 2-10)

Table 2-8: Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide Existing Houses Program. If you had not participated in the EnerGuide Existing Houses Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have...			
FR3a.	Postponed making energy efficient upgrades to your home by more than one year	Yes	0%
		No	50%
FR3b.	Would not have made any energy efficient upgrades to your home	Don't know	25%
FR3c.	Would have made fewer energy efficiency upgrades to your home	Yes	See (3ci)
		No	50%
		Don't know	25%
FR3ci.	[IF FR3c = YES] Would you have made slightly, somewhat, or significantly fewer energy efficiency upgrades to your home?	Slightly	25%
		Somewhat	25%
		Significantly	0%
		Don't know	25%
FR3d.	Would have made the same amount of energy efficient upgrades as those made through the program	Yes	50%
		No	25%
		Don't know	25%
Stated Intent Score = average of FR3a, FR3b, FR3c+ci, and FR3d.			

Table 2-9: Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following elements to your decision to install equipment or make energy efficiency upgrades as part of the EnerGuide Existing Houses program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program 'had no influence at all on your decision to participate in the EnerGuide Existing Houses program' and 5 indicates that the program was 'extremely influential to your decision to improve the energy efficiency of your home.' How influential was the::			
FR5a.	Program incentives or rebates	1	50%
		2	37.5%
FR5b.	Information or advice from the energy audit	3	25%
		4	12.5%
FR5c.	Information, advice, or services provided by a contractor	5	0%
		Don't know	25%
Program Influence Score = maximum of FR5a, FR5b, or FR5c.			

Table 2-10: Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Score
Screening			
Q15 & FR1.	Did you have any specific plans to pursue any of the recommended improvements that you have installed BEFORE talking with anyone about the EnerGuide for Existing Houses program? If yes, which ones did you plan to install?	Planned and installed Planned but not installed Unplanned installation	N/A
FR2.	Before your initial energy audit, had you contacted any contractors about any of the electric space or water heating equipment that you later installed as part of the EnerGuide for Existing Houses program?	Yes No Don't know	
Budget Check			
FR4.	Nova Scotia Power paid \$[prompt with actual incentive] for the energy efficient upgrades made to your home. If you had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades including the incentive?	Yes No Don't know	N/A

Based on their responses to these questions, NMR divided respondents into three distinct groups:

- Full free-riders – those participants who would have installed the same energy efficiency measures in the absence of the program;
- Non-free-riders – those participants who would not have installed any of the energy efficient measures within one year of program participation;
- Partial free-riders – those participants who would have installed measures within one year of program participation, but in smaller quantities or of lesser efficiency.

2.6.1 Full Free-riders

Respondents were identified as full free-riders if they simultaneously met four criteria:

- They stated that they had had pre-existing specific plans to install all of the measures that they had installed through the program prior to talking with anyone about the EEH program:
Q15 & FR1 = PLANNED AND INSTALLED (see Table 2-10)

AND

- They said that, before the initial energy audit, they had contacted a contractor about any of the electric space or water heating equipment that they later installed as part of the EEH program:
FR2 = YES (see Table 2-10)

AND

- They said that their budget could have accommodated the full cost of the energy efficient upgrades including the incentive:

FR4 = YES (see Table 2-10)

AND

- They said that, in the absence of the EEH program, they would have made the same amount of energy efficient upgrades as those made through the program within one year:

FR3a = NO and FR3d = YES (see Table 2-8)

Among the 70 respondents, one respondent who had installed a heat pump was classified as a full (100%) free-rider.

2.6.2 Non-Free-riders

Respondents were identified as non-free-riders if they simultaneously met the following four criteria:

- They stated that they had not had any specific pre-existing plans to install any of the measures that they had installed through the program prior to talking with anyone about the EEH program:

Q15 & FR1 = UNPLANNED INSTALLATION (see Table 2-10)

AND

- They said that, before the initial energy audit, they had not contacted a contractor about any of the electric space or water heating equipment that they later installed as part of the EEH program:

FR2 = NO (see Table 2-10)

AND

- They said at least one program element was ‘extremely’ influential to their decision to install energy efficient measures:

Maximum value of FR5a, FR5b, FR5c = 5 (see Table 2-9)

AND

- They indicated they would have installed no energy efficient measures in the absence of the program:

Free-rider rate for FR3a, FR3b, FR3ci = 0% and FR3d=NO (see Table 2-8)

Among the 70 respondents, three respondents were classified as non-free-riders (0%). Two of these respondents had installed programmable thermostats and one reported having installed pipe insulation.

2.6.3 Partial Free-riders

Respondents not identified as either a full free-rider or a non-free-rider were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relied on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence the results were then averaged to determine a final free-ridership rate.

2.6.3.1 Stated Intentions

In order to derive respondents’ intentions, they were asked to consider what actions they would have taken in the absence of the EEH program. Respondents were asked four questions as shown in Table 2-8.

Based on their responses, each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 31.25%.

- FR3a = Yes (0%)
- FR3b = No (50%)
- FR3c = Yes; FR3ci = Somewhat (25%)
- FR3d = Yes (50%)

2.6.3.2 Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of three program elements on their decision to install energy efficient measures on a scale of one to five, where one meant the program had ‘had no influence at all’ on their decision and five meant that the program had been ‘extremely influential’ to their decision to install energy efficient measures.

2.6.3.3 Impact of Budget

For respondents who received a stated intentions free-ridership rate of 50%, a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project, no adjustments were made, if they said their budget could not have accommodated the project, their free-rider stated intent score was reduced to 25%.

2.6.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each respondent, their free-rider stated intent score was averaged with their program influence free-rider score. The resulting free-ridership proportion for the 2010 EEH program was 20.4%. To calculate program-level free-ridership, NMR weighted measure-level responses by their relative energy savings based on the program tracking records. Based on this, NMR determined the total free-ridership level for the 2010 EEH program to be 24% which yielded a net-to-gross ratio of 0.76. This was substantially higher than the 2009 free-ridership level of 3%. It is important to note that NMR used two separate methods to calculate free-ridership in 2009 and 2010 for the EEH program.

- In 2009, a total of 23 participants responded to the NMR survey of participants. NMR estimated free-ridership based on a detailed review of each individual respondent’s answers to a series of questions based on the standardized methods outlined by PA Consulting in 2003.²⁷
- In 2010, based on the decision of the DSM Administrator sponsored Free-ridership Symposium (May 2010), NMR completely revised the free-ridership questions included in the 2010 survey and mirrored the free-ridership calculations developed for the Energy Trust of Oregon by Research into Action.

²⁷ PA (2003) *Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report*. Submitted June 16, 2003

2.7 Energy Savings Estimation

Table 2-11 presents the final estimates of savings for the EEH program including the impact of free-ridership. The evaluated energy savings for the 2010 EEH program were determined to be 7,274 MWh at the meter and 8,138 MWh at the generator, using a line loss factor of 1.1188. The evaluated demand savings for the 2010 EEH program were determined to be 1,943 kW at the meter and 2,174 kW at the generator. The 2010 DSM plan showed the EEH program goal to be 4,930 MWh of energy savings and 1,410 kW of demand savings. The evaluated program savings thus substantially exceeded the program's energy and demand savings goals.

Table 2-11: Program Energy and Demand Savings Estimates

Population	2009				2010			
	Tracking Estimate		Evaluation Impact Savings Estimate		Tracking Estimate*		Evaluation Impact Savings Estimate	
	Meter	Generator	Meter	Generator	Meter	Generator	Meter	Generator
Energy (MWh)	3,334	3,730	2,767	3,096	9,723	10,878	7,274	8,138
Demand (kW)	510	570	423	474	1,085	1,214	1,943	2,174

* The demand savings in the 2010 tracking database were only for Electric Thermal Storage (ETS) measures.

3 Process Evaluation

3.1 Methodology

The 2010 process evaluation of the EnerGuide Existing Houses (EEH) program drew upon in-depth interviews conducted with program staff and contractors as well as a survey of program participants.

3.1.1 In-depth Interviews

The 2010 EEH program used six Delivery Agents to implement the program throughout the province. Each Delivery Agent employed varying numbers of Energy Advisors. For the 2010 evaluation, NMR conducted in-depth interviews with the primary contact at four of the six Delivery Agents. NMR also conducted in-depth interviews with two program managers from the DSM Administrator and CNS. The interviews covered topics that included the program delivery process, tracking and reporting, satisfaction with procedures and suggestions for improvement. These interviews took an average of 30 minutes each to complete. In addition, NMR conducted one in-depth interview with the DSM Administrator's marketing staff. This interview covered all of the programs and took about 90 minutes to complete.

The administration and delivery of the EnerGuide for New Houses and Low Income Residential Affordability programs overlapped at least partly with those of the EEH program. Thus, to the extent feasible, interviews with staff or delivery agents who worked on both programs were combined to avoid having to conduct multiple interviews with the same person.

3.1.2 Participant Survey

NMR completed a total of 70 interviews with 2010 program participants between August and November 2010. The sample of participants was provided by the DSM Administrator from its program tracking database which, as of October 2010, included 178 participants who had completed a final audit. The survey included questions about various aspects of program satisfaction, sources of information, motivations and barriers, program value and recommendations for improvement.

3.1.3 Sampling Error

Table 3-1 shows the estimated population, sample size and sampling error for the telephone survey. For the participant survey, the sampling error was $\pm 9.6\%$ at the 90% confidence level. The sampling error for differences between the 2010 and 2009 samples was $\pm 18.5\%$ at the 90% confidence level. Note that in the tables in this report the " α " symbol is used to indicate differences between 2010 and 2009 that were significant at the 90% confidence level.

Table 3-1: Sample Size and Sampling Error

	2009			2010		
	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
	520	23	$\pm 17.3\%$	1,516	70	$\pm 9.6\%$

3.2 Program Goals and Design

The 2010 EEH program had a target of 4,930 MWh of energy savings and 1,410 kW of demand savings. The 2010 EEH program was jointly sponsored by the DSM Administrator, CNS and NRCan. However, NRCan ended their offer of rebates in the program in March 2010 suddenly as opposed to a planned exit in March 2011. NRCan is still supporting the program administratively and has committed to continue to support the software. The EnerGuide program currently has an end date of March 31st 2011; it has not been confirmed if the program will continue past that date, or what other program may take its place if EEH does not continue. In 2010, the program contracted with six competitively-selected service providers, termed “Delivery Agents,” to provide services throughout Nova Scotia.

3.2.1 Exit of NRCan

NRCan suddenly ended their offer of rebates in the program in March of 2010, a year earlier than anticipated. With the NRCan funding, a participant could qualify for upwards of \$6,500 in rebates. In the absence of NRCan’s funding they can get rebates for only \$1,500 in addition to any DSM Administrator rebates. Furthermore, this program is currently anticipated to end as of March 31st 2011.

According to program and marketing staff, consumers thought that the program had ended with NRCan’s exit and, as a result, participation in the program was down 60%. Each of the Delivery Agents reported a decrease in their business since NRCan pulled funding from the program. Three of the Delivery Agents had to lay off a significant portion of their staff, while another had to redistribute staff to other programs. Marketing staff also reported a lot of misunderstanding among Delivery Agents who were frustrated with the changes and didn’t want to engage with the program until all the changes had been settled.

3.2.2 Delivery Agent Understanding of Program Goals

During the in-depth interviews, when asked to identify the goals of the EEH program, the Delivery Agents and the Energy Advisors primarily said that the goal of the EEH program was to improve energy efficiency. All of the Delivery Agents believed that federal funding, which had been withdrawn by NRCan, was necessary for the program to exist. All of the Delivery Agents also observed that a large majority of the public was unaware of the fact that a provincial program existed.

3.3 Program Responsibility and Communication

3.3.1 Marketing and Outreach

CNS promotes the EEH program through various communications channels such as newspapers, television, radio, online and home shows. In addition to CNS’s promotion of the program, Delivery Agents are also able to promote the program further. During the in-depth interviews, the Delivery Agents said that their initial contract with NRCan had required them to engage in marketing and outreach activities for the EEH program. With the exit of NRCan, most of the Delivery Agents took up more aggressive marketing activities to continue the promotion of the program. Delivery Agents also remarked that they did not have sufficient resources to conduct marketing activities for the program. Despite this they were increasing their presence at home shows, working with contractors more and running what media ads they could to promote and build awareness for the continuation of the program. Marketing staff also reported that they had sought to address contractor concerns about the program and the decline in participation through increased program promotions such as radio advertising and articles in publications.

3.3.2 Contractor Training and Contractual Relationships

The Delivery Agents have contracts with the Province of Nova Scotia (via CNS) to offer the EEH program in Nova Scotia. Delivery Agents have contractual obligations to NRCan with regard to operation of the EnerGuide software, and this continues after the federal rebates were removed from the program. NRCan is still supporting the program administratively and continues to provide training for Energy Evaluators. It has committed to continue supporting the EnerGuide software and perform quality assurance on the uploaded files.

3.3.3 Customer Responsibilities

The EEH program places the full burden of contractor selection on the customer and does not provide any training for contractors that install the energy efficiency equipment. NMR has identified this as a potential gap in program design. Contractor training ensures that energy efficiency measures are installed correctly; without proper training, contractors may install equipment incorrectly and the savings opportunities may not be fully realized.

3.4 Program Delivery

3.4.1 Delivery Agent Perspectives

While two of the four Delivery Agents interviewed indicated that the program delivery process was unchanged, the other two believe that the process had become more burdensome. One of the Delivery Agents thought that the process had become more burdensome because of increased quality assurance requirements and data tracking forms; the other indicated that the decrease in overall participation had resulted in participants being more spread out, which increased travel distances and time.

3.4.2 On-Site Visits

NMR conducted two on-site visits, accompanying Energy Advisors to a “D” audit and an “E” audit. Both on-site visits revealed that contractor services were comprehensive and performed very professionally. In the “D” audit, the Energy Advisor performed a comprehensive audit of the home and gave the customer a clear and complete explanation of what to expect from the evaluation. In the “E” audit, the Energy Advisor conducted an accurate blower door test and thoroughly inspected all of the work that had been done. The customer remarked that they had observed an immediate difference in their electric bill as a result of installing the measures rebated by the program.

3.5 Program Tracking and Reporting

Delivery Agents were responsible for using the HOT2000 software from NRCan to create audit reports for the EEH program. After completing the pre- and post-retrofit audits, the Delivery Agents were responsible for uploading HOT2000 files to NRCan for review and validation. After the NRCan review, CNS was authorized to release funds to participants and invoice the DSM Administrator for its portion of the rebates. In addition to the HOT2000 reports, the DSM Administrator required Delivery Agents to complete a short form that includes the DSM Administrator-sponsored measures installed through the program.

The 2009 evaluation revealed that, due to information-sharing issues between NRCan, CNS and the DSM Administrator, the DSM Administrator had had difficulty retrieving the HOT2000 audit reports for participants. In addition, the DSM Administrator was unable to retrieve any of the audit reports for participants who had completed the pre-retrofit audit but not the post-retrofit audit.

Many of these communication issues regarding data tracking and reporting may be resolved as energy efficiency activities in Nova Scotia are consolidated under the new Efficiency Nova Scotia Corporation (ENSC). However, ENSC should work with NRCan to ensure a free exchange of participant information and HOT2000 audit reports.

3.6 Program Awareness and Participation

3.6.1 Program Awareness

When asked how they had learned about the program, two-fifths of participants in 2010 (40%) and nearly one-half of the participants in 2009 (48%) said that they had heard about the program through word-of-mouth. (Table 3-2) This was consistent with observations from the in-depth interviews—three out of four delivery agents said that most people had heard about the program through word-of-mouth. Other ways that customers frequently mentioned finding out about the program were through the Internet (14%) and the newspaper (10%).

Table 3-2: How Customers Learned About the Program (multiple responses)

	2009	2010
<i>Sample size</i>	23	70
Word-of-mouth	48%	40%
Newspaper ad or story	17%	14%
The Internet	13%	10%
Television	9%	8%
Home show	9%	8%
Radio	9%	6%
Work with energy related company	4%	4%
Brochure	9%	3%
Geothermal company	4%	3%
Building supply dealer	--	3%
Nova Scotia Power bill insert	--	1%
Bank	--	1%
Delivery Agent—SHEC	9%	--
Literature from exhibition	--	--
Community center	--	--
Don't know	--	--

All of the delivery agents said that customers in their service territory were not aware that, even though NRCan has withdrawn its rebates, the provincial program was still in place. Only one delivery agent said that more and more people were becoming aware of the program.

3.6.2 Participation Motivations and Barriers

Respondents were asked if, prior to program participation, they had had any concerns about taking part in the program. In both program years, very few respondents reported any such concerns. Those who expressed any concerns primarily thought the program would inhibit them from making energy efficient upgrades and completing their renovations on schedule. According to the Delivery Agents, reasons for lack of participation included: at some homes there was just nothing to do, some people were apathetic about the program, and some people didn't want to work with the government.

Table 3-3: Concerns Prior to Program Participation

	2009	2010
<i>Sample size</i>	23	70
Yes	9%	7%
No	91	93

Respondents were asked about the reasons they had been interested in having their homes evaluated by an Energy Advisor. (Table 3-4) In 2010, the most important reasons mentioned by respondents were that they had wanted to save on their energy bills (26%) and that they had already been thinking about energy efficient upgrades (24%). These were followed by wanting to find out how energy efficient their home was (20%). In contrast, the single most important reason that 2009 respondents mentioned for having their homes evaluated was that they had already been thinking about energy efficient upgrades (39%).

Table 3-4: Reasons for Interest in Having Home Evaluated

	2009		2010	
	Primary Reason	Secondary Reasons (Multiple Response)	Primary Reason	Secondary Reasons (Multiple Response)
<i>Sample size</i>	23	23	70	70
To save on energy costs/bills	17%	17%	26%	16%
Thinking about energy efficient upgrades already	39	13	24	10
Find out how efficient my home was	9	17	20	14
Rebates	13	26	11	10
To get an experts opinion on how to make my home more efficient	4	13	9	6
To save energy	17	22	6	8
To help the environment	--	13	4	3
Blower door test	--	4	--	1
No other reasons	na	13	na	30

3.7 Participant Plans & Actions

3.7.1 Prior Plans and Actions

Respondents were asked if they had had plans to pursue any of the recommended improvements that they installed before talking with anyone about the EEH program and, if they did, which specific measures they had planned to install. In 2010, three out of five respondents reported having had no such plans and, conversely, two out of five respondents reported prior plans to install at least of one of the measures. However, fewer than one in ten respondents reported specific plans to install any single measure. (Table 3-5)

Table 3-5: Prior Plans to Install Measure

	2009	2010
<i>Sample Size</i>	23	70
Solar Hot Water	13%	9%
ETS Room Units	4%	9%
Heat Pump	22%	6% ^a
High efficiency ductless mini split	0%	4% ^a
Electric Programmable Thermostat	13%	3%
Drain Water Heater Recovery System	0%	3%
Water Heater Tank Insulation	0%	3%
Water Heater Exposed Pipe Insulation	0%	3%
ETS Furnace	4%	1%
No plans to install	52%	57%
Don't Know	0%	3%

Respondents were also asked if, before their initial energy audit, they had contacted any contractors about any of the electric space or water heating equipment that they later installed as part of the EEH program. Nearly one in three respondents reported having made such contact with a contractor prior to the first audit. (Table 3-6)

Table 3-6: Contacted Contractor Prior to Audit

	2009	2010
<i>Sample Size</i>	23	70
Yes	22%	31%
No	13%	66%
Don't Know	0%	3%

3.7.2 Recommendations and Installations through the Program

Respondents were asked about the measures they recalled being recommended after the pre-retrofit audit and were then asked to verify the measures installed based on program records. Note that, in 2010, three new measures—high efficiency ductless mini split heat pump, electric water heat tank insulation, and electric water heater exposed pipe insulation—were included in the list of possible recommendations.

As Table 3-7 shows, the most frequently-recommended and installed technology in both 2010 and 2009 was programmable electronic thermostats—in both years around two out of three respondents recalled this recommendation (66% in 2010 and 70% in 2009) and around two out of five reported their installation (41% in 2010 and 43% in 2009). In 2010, the second most frequently installed measures included solar domestic water heating (11%), electric thermal storage room units (11%), electric water heater exposed pipe insulation (10%), and high efficiency air-to-air heat pump with electric backup (9%). Although electric water heater tank insulation was the second most frequently recommended measure (43%), very few respondents (7%) followed up on installing it.

Table 3-7: Recommended and Installed Measures

	2009		2010	
	Recommended	Installed	Recommended	Installed
<i>Sample size</i>	23	23	70	70
Electronic thermostats	70%	43%	66%	41%
Solar domestic water heating system	30%	13%	26%	11%
Electric Thermal Storage room units	22%	--	23%	11%
Electric water heater exposed pipe insulation	na	na	36%	10%
High efficiency air to air heat pump with electric backup	22%	13%	20%	9%
Electric water heater tank insulation	na	na	43%	7%
High efficiency air to air heat pump with non-electric backup	13%	--	10%	7%
High efficiency ground source heat pump	30%	22%	16%	4% ^a
High efficiency ductless mini split heat pump	na	na	13%	4%
Electric Thermal Storage central hydronic system	4%	4%	4%	3%
Drain water recovery	13%	--	13%	1%
Electric Thermal Storage hot air furnace	13%	--	6%	--

Table 3-8 shows measure uptake (installations as a percentage of recommendations), estimated annual energy savings, EEH program incentive amount, and cost per kWh of annual savings. NMR used this information to develop a “Measure Effectiveness Index” and a “Measure Opportunity Index,” also shown in Table 3-8. The Measure Effectiveness Index was calculated by dividing the measure uptake by the cost per kWh of annual savings—the larger the number, the more effective was the measure in terms of participant response and cost effectiveness to the program.

Analysis of the Measure Effectiveness Index revealed that electronic thermostats, high efficiency air-to-air heat pump with non-electric backup, electric water heater exposed pipe insulation, high efficiency ductless mini split heat pump, and electric water heater tank insulation had been particularly effective measures for the 2010 program.

Table 3-8: Effectiveness of Measures*

	Measure Uptake	Per Unit Annual Energy Savings (kWh/yr)**	Per Unit EEH Incentive	Cost per kWh of annual savings	Measure Effectiveness Index
High efficiency air to air heat pump with non-electric backup	70%	7,208	\$1,200	\$0.17	4.20
Electronic thermostats	62%	205	\$15	\$0.07	8.47
High efficiency air to air heat pump with electric backup	45%	3,340	\$900	\$0.27	1.67
Solar domestic water heating system	42%	2,112	\$1,250	\$0.59	0.71
High efficiency ductless mini split heat pump	31%	7,325	\$750	\$0.10	3.03
Electric water heater exposed pipe insulation	28%	122	\$10	\$0.08	3.42
High efficiency ground source heat pump	25%	12,745	\$2,500	\$0.20	1.27
Electric water heater tank insulation	16%	400	\$25	\$0.06	2.56
Drain water recovery (42%+ efficiency)***	8%	1,086	\$130	\$0.12	0.64

* ETS units are excluded from this analysis because they had only demand savings.

** Estimates from the DSM Administrators consultant in EEH program tracking spreadsheet.

*** There were no installations of drain water recovery with 30% - 41.9% efficiency.

Three out of four 2010 respondents (76%) mentioned at least one recommended measure that they had decided not to install. Of these respondents, the predominant reason for not having installed a measure was that it was too expensive, which was mentioned by slightly under one-half of respondents (46%). This was relatively consistent with the 2009 responses, when one in three respondents (33%) most frequently cited the expense as their reason for not installing a recommended measure. This also paralleled remarks by the Delivery Agents who said that the cost of installing the measures was the main reason that people had dropped out of the program after the “D” Audit.

Table 3-9: Reasons All Recommended Measures Were Not Installed

	2009		2010	
	Primary Reason	Secondary Reasons (Multiple Response)	Primary Reason	Secondary Reasons (Multiple Response)
<i>Sample size</i>	15	15	50	41
Too expensive	33%	7%	46%	17%
Don't think I really need it	7	7%	12	4%
We didn't replace things that were still working	7	--	6	--
Need to do more research on recommended measures	13	0%	4	0%
Too busy	7	--	4	--
Plan to install in the future	0	20%	2	6%
Want to install upgrades that aren't covered through the program	7	--	2	3%
Insulation is not environmentally friendly	7	--	2	--
Don't have the cash needed	13	--	--	2
Rebate not big enough	7	7%	--	--
Had another heat source	0	7%	--	--
Looking for alternatives	0	7%	--	--
No other reasons	--	47%	--	63%
Don't Know	--	--	22 ^a	--

Respondents who reported not having installed recommended measures were asked if they had any intentions to install those measures in the future. Only two respondents reported that they were planning to install the recommended measures in the future.

3.7.3 Program Influence on Installation Decision

Respondents were asked to rate the influence of three program factors on their decision to install the EEH-rebated measures. The information or advice received from the energy audit was the most influential factor with about three out of four respondents (77%) giving the factor a rating of extremely or very influential. The program incentives or rebates was the second most influential factor with over two out of three respondents (69%) giving the factor a rating of extremely or very influential. Information, advice, or services provided by a contractor was the least influential factor with about two out of five respondents (41%) giving the factor a rating of extremely or very influential. (Table 3-10)

Table 3-10: Influence of Various Factors on Decision to Install Measures

(1='program had no influence at all to 5='program was extremely influential')

	2010						
	Sample Size	1	2	3	4	5	dk
Program Incentives or rebates	70	6%	10	14	26	43	1
Information or advice from the energy audit		3%	11	9	40	37	--
Information, advice, or services provided by a contractor		20%	16	20	24	17	3

3.7.1 Installations of Non-Program Measures

About two out of five respondents (43%) reported that they had installed efficiency upgrades that had not been recommended by the EEH program in 2010. The most frequently mentioned upgrades undertaken by respondents in 2010 were installing additional insulation (67%) and new windows (40%). In 2009, respondents most frequently mentioned installing insulation (55%) followed by new doors (36%) and new windows (27%). (Table 3-11)

Table 3-11: Other Installed Upgrades Not Recommended by the Program

	2009	2010
Sample size	11	30
Insulation*	55%	67%
New windows*	27%	40%
New doors*	36%	10%
Weather stripping*	18%	7%
New garage door*	18%	7%
Low flow toilet*	18%	7%
Electric hot water heater	9%	3%
CFLs	9%	3%
New roof	9%	0%
Steel roof	9%	0%
New siding	9%	0%
Wood stoves and inserts	9%	0%
Ceiling fan	9%	0%

*Measures that are eligible for rebates under the program

3.8 Satisfaction and Program Impact

3.8.1 Satisfaction with the Program

Respondents exhibited very high satisfaction with the program overall. The majority of respondents (95% in 2010 and 96% in 2009) were either very satisfied or satisfied with the program overall. (Table 3-12) In 2010, only one respondent expressed dissatisfaction with the program because he or she had to physically install the energy efficient upgrade as hiring a contractor would have been too expensive.

Table 3-12: Overall Satisfaction with the Program

	2009	2010
<i>Sample size</i>	23	70
Very satisfied	70%	75%
Satisfied	26	20
Neither satisfied or dissatisfied	0	3
Dissatisfied	4	2
Very dissatisfied	0	0

Table 3-13 shows respondent satisfaction with specific aspects of the program. Practically all of the 2010 respondents were satisfied with the initial energy audit, the courteousness of the Energy Advisor, and the information provided by the Energy Advisor. In addition, the large majority of respondents said they were satisfied with the scheduling and timing of the first and final audits, the initial audit report and recommendations, and the final energy audit overall. It is important to note that, at the time of the survey, not all respondents had received their final rebate cheques from the program.

Table 3-13: Overall Satisfaction with Specific Aspects of the Program

(% Very Satisfied / Satisfied)

	2009	2010
<i>Sample size</i>	23	70
First energy audit overall	100%	99%
Scheduling and timing of the first audit	86%	93%
Courteousness of Energy Advisor	100%	100%
Information provided by Energy Advisor	100%	99%
Report received about homes current energy use and recommendations	100%	96%
Final energy audit overall	87%	93%
Scheduling and timing of the final audit	96%	96%

Practically all of the 2010 respondents (97%) were satisfied with the energy efficient upgrades they had received through the program. (Table 3-14)

Table 3-14: Satisfaction with Energy Efficient Upgrades

	2009	2010
<i>Sample size</i>	22	65
Very satisfied / Satisfied	100%	97%

Respondents were asked to rate the overall value of the program to themselves as well as to the other occupants of their homes. Based on a scale of one to five, where one is little value and five is immense value, the large majority 2010 respondents (91%) gave the program a rating of four or five. (Table 3-15)

Table 3-15: 2010 Overall Value of the EnerGuide for Existing Houses Program

	2009	2010
<i>Sample size</i>	23	70
Immense Value / High Value	95%	91%

3.8.2 Impacts of the Program

Eight out of nine 2010 respondents (89 %) said they had noticed a change in the comfort levels in their homes. They most frequently reported that temperatures were more even throughout their homes (71%) and that there were fewer drafts (29%) throughout their homes in 2010. Note, however, that significantly lower percentages of respondents in 2010 (29%) mentioned fewer drafts than in 2009 (47%). (Table 3-16)

Table 3-16: Change in Comfort

Noticed Change in Comfort Levels	2009	2010
<i>Sample size</i>	22	65
Yes	86%	89%
No	9	8
Don't know	--	3
Refused	5	--
Changes Noticed	2009 (multiple response)	2010 (multiple response)
<i>Sample size</i>	19	59
Even temperatures throughout the home	79%	71%
Fewer drafts throughout the home	47%	29%
More convenient to control temperatures automatically	21%	15%
Affordable heat/warmer	21%	12%
Air is fresher	--	9% ^a
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% ^a
Don't Know	--	2%

Nearly three out of five 2010 respondents (57%) reported a decrease in their energy bills since the installation of their upgrades. About one in ten (11%) respondents reported that they had either seen no change or an increase in their energy bills. (Table 3-17) There were no significant differences between 2010 participants and 2009 participants on the program impacts. In 2010 and 2009 over one-half of all participants reported that their electric bill had decreased and they were very satisfied with the economic savings. (Table 3-17)

Table 3-17: Impacts of the Program

Time since installation	2009	2010
<i>Sample size</i>	23	70
One to six months	30%	34%
Seven months to a year	39	40
More than one year	30	24
Impact on energy bills	2009	2010
<i>Sample size</i>	23	70
Bills have gone down	65%	57%
Bills have gone up	9	4
No change in the bills	4	7
Hasn't been long enough to know	17	27
Don't know	4	4
Satisfaction with impacts on bills	2009	2010
<i>Sample size</i>	22	67
Very satisfied	50%	57%
Satisfied	32	15
Neither satisfied nor dissatisfied	9	13
Dissatisfied	5	5
Don't know	5	10

In an on-site visit where NMR accompanied the Energy Advisor to an "E" audit, the customer remarked that they had observed an immediate and substantial difference in their electric bill as a result of having installed the measures rebated by the program.

3.8.3 Recommendations for Improvement

Two out of five 2010 participants (41%) thought that the EEH program should offer rebates for additional upgrades. (Table 3-18) When asked about what additional upgrades they would like to see, participants gave responses that ranged from various forms of renewable power (e.g., small wind, solar electricity) to “encouraging people to get more energy efficient appliances.”

Table 3-18: Suggest Additional Upgrades

	2009	2010
<i>Sample size</i>	23	70
Yes	35%	41%
No	57	46
Don't know	9	0

Respondents were asked if they had any recommendations for improving the program. About one-half of 2010 participants (54%) offered at least one recommendation, significantly fewer than in 2009 (78%). One-third of these respondents (34%) suggested some form of increased rebates or incentives from the program such as making fees tax deductible or providing incentives for replacing major appliances. Other recommendations offered including more renewable technologies, an increase in the length of the program, and improvements in various aspects of program administration. (Table 3-19)

Table 3-19: Suggested Program Improvements

	2009	2010
<i>Sample size</i>	23	70
Yes	78%	54% ^a
No	22	46 ^a

3.9 Demographics

The overwhelming majority of the 2010 respondents (93%) were likely to live in single family homes (Table 3-20) with at least three bedrooms (93%). (Table 3-21)

Table 3-20: Type of Residence

	2009	2010
<i>Sample size</i>	23	70
Single-family detached	100%	93%
Semi-detached	--	6
Row house	--	1
Townhouse or duplex	--	--
Apartment with fewer than five stories	--	--
Mobile home or house trailer	--	--
Apartment with more than five stories	--	--

Table 3-21: Number of Bedrooms

	2009	2010
<i>Sample size</i>	23	70
1	0%	0%
2	17	7
3	52	53
4 or more	30	40

About three out of five 2010 respondents (61%) had an annual income of at least \$50,000, significantly fewer than in 2009 (74%). (Table 3-22)

Table 3-22: Annual Income

	2009	2010
<i>Sample size</i>	23	70
Less than \$15,000	0%	0%
\$15,000 to \$24,999	4	3
\$25,000 to \$34,999	4	11
\$35,000 to \$49,999	17	13
\$50,000 to \$69,999	13	19
\$70,000 to \$79,999	9	6
\$80,000 or more	52	36
Refused	--	13

Practically all the respondents (99%) in 2010 and 2009 (100%) lived in their homes year round. (Table 3-23)

Table 3-23: Seasonal Home

	2009	2010
<i>Sample size</i>	23	70
No	100%	99%
Yes	--	1

The 2010 respondents were most likely to live in homes with two or three full time residents (72%). (Table 3-24)

Table 3-24: Number of Full Time Residents

	2009	2010
<i>Sample size</i>	23	70
1	4%	7%
2	44	51
3	30	21
4	22	11
5 or more	--	9
Average	2.7	2.6

Around two-thirds (65%) of 2010 respondents were 45 years of age or older. Compared to 2009, there were significantly fewer respondents in 2010 between 45 and 54 years old (20% in 2010 versus 39% in 2009) and significantly more respondents who were 65 years or older (11% in 2010 versus 0% in 2009). (Table 3-25)

Table 3-25: Respondent Age

	2009	2010
<i>Sample size</i>	23	70
18 to 24	4%	0%
25 to 34	17	19
35 to 44	9	16
45 to 54	39	20 ^a
55 to 64	30	34
65 or older	--	11 ^a

About three out of five 2010 respondents (59%) had earned a university diploma. (Table 3-26)

Table 3-26: Educational Attainment

	2009	2010
<i>Sample size</i>	23	70
Less than high school	0%	6%
High school graduate	13	19
Trade certificate	0	7
College diploma	17	10
University diploma	70	59
Refused	--	--

About two out of three 2010 respondents were male. (Table 3-27)

Table 3-27: Gender

	2009	2010
<i>Sample size</i>	23	70
Male	52%	66%
Female	48	34

Appendix A Participant Survey

NSPI – EnerGuide for Existing Houses Program – Participant Survey

Hello may I please speak with [INSERT NAME]?

1 Yes [GOTO INTRODUCTION]

2 No [SAY “Perhaps you can help me anyway.” GOTO INTRODUCTION]

INTRODUCTION

Hello, my name is _____, from NMR Group. I am calling on behalf of the EnerGuide for Existing Houses program from Nova Scotia Power and Conserve Nova Scotia.

1. We understand you participated in the EnerGuide for Existing Houses rebate 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 your 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 program?”]

___Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

___No [THANK & TERMINATE]

3 Don’t know [PROMPT: “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 your 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 program?”]

___Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

___No [THANK & TERMINATE]

Refused [THANK AND TERMINATE]

“I’m NOT calling about your electricity bill or selling anything. We would like to learn a bit about your experience with participating in the EnerGuide for Existing Houses rebate program. Your opinions are very important to us and will help us improve this program and other services for

customers. Your responses will be kept strictly confidential.” [IF NEEDED, READ, “The survey should take about 15 minutes.”]

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

[SCHEDULED, IF NECESSARY, FOR: _____]

Section 1 - How Learned about Program/Reasons for Participating

2. How did you first learn about the EnerGuide for Existing Houses program? [DO NOT READ. ACCEPT MULTIPLE]

1. (Nova Scotia Power Bill insert)
 2. (A utility other than Nova Scotia Power)
 3. (Nova Scotia Power Website)
 4. (Conserve Nova Scotia Website)
 5. (Natural Resources Canada Website)
 6. (The Internet)
 7. (Nova Scotia Power on-hold message)
 8. (Radio Ad)
 9. (Newspaper Ad or Story)
 10. (Program Delivery Agent--[Name of DA-4])
 11. (Program Delivery Agent: [Name of DA-3])
 12. (Program Delivery Agent:[Name of DA-2])
 13. (Program Delivery Agent: [Name of DA-1])
 14. (From a contractor)
 15. (Word of mouth -- neighbor, friend, co-worker, family member, etc.)
 16. (Other) [SPECIFY _____]
- 88 Don't know
- 98 Refused

3. 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 program. What was the ONE most important reason you were interested in having your home evaluated by an EnerGuide Energy Advisor? [SAME LIST AS IN Q4 below]

4. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE RESPONSES]

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)
7. (Other) [SPECIFY _____]
8. (No other reasons)
88. (Don't know)
99. (Refused)

5. Before participating, did you have any concerns about taking part in the program?
1. (Yes)
 2. (No)
 8. (Don't know)
 9. (Refused)
6. [IF Q5 = 1] What were those concerns? [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)
 8. (Other) [SPECIFY _____]
 9. Don't know
 10. Refused

Section 2 – Satisfaction with program

7. 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?
1. Very satisfied
 2. Satisfied
 3. Neither satisfied nor dissatisfied
 4. Dissatisfied
 5. Very Dissatisfied
 8. Don't know
 9. Refused
8. [IF Q7 = 4 or 5] You indicated that you were not satisfied with the program overall. What was the ONE most important reason you were not satisfied with the program overall? [PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE – RECORD VERBATIM – 8 = DK, 9 = REF]
9. Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE; RECORD VERBATIM – 7 = NO OTHER REASON, 8 = DK, 9 = REF]

10. Now I'm going to ask you about your experience with specific aspects of your experience with the EnerGuide 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.

	V.Satisf	Satisf	Neither	Dissat	V.Dissat	DK/Ref
10a. 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	9
10b. Scheduling and timing of the first audit	1	2	3	4	5	9
10c. Courteousness of Energy Advisor	1	2	3	4	5	9
10d. Information provided by Energy Advisor	1	2	3	4	5	9
10e. The report you received about your home's current energy use and recommendations for energy efficient upgrades	1	2	3	4	5	9

[IF AUDIT = E ASK Q10f through 10i, Otherwise SKIP to Q11 below]

10f. The Final Energy Audit Overall This was the second audit of your home's energy use to assess the impact of the energy efficient upgrades that you had installed.	1	2	3	4	5	9
10g. Scheduling and timing of the final audit	1	2	3	4	5	9
10h. The rebates provided by the program overall	1	2	3	4	5	9
10i. The rebates provided by the program for electric space and water heating measures	1	2	3	4	5	9

11. [IF Q10a = 4 or 5 or Q10f=4 or 5] You indicated that you were not satisfied with the first and/or final energy audit was that was done of your home. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE – RECORD VERBATIM – 7 = NO OTHER REASON, 8 = DK, 9 = REF]
12. [IF Q10a = 4 or 5 or Q10f=4 or 5] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE; RECORD VERBATIM – 7 = NO OTHER REASON, 8 = DK, 9 = REF]

Section 3 - Verification of actions taken and any additional actions/Reasons for non-action/Satisfaction with energy efficiency upgrades

[IF IN SAMPLE FILE 'AUDIT STAGE' = 'E' SKIP TO Q21 OTHERWISE CONTINUE]

13. I am going to read you a list of electric space or water heating equipment that may have been recommended by the Energy Advisor for your home. For each one, can you please tell me if that measure was recommended for your home?

[1 = YES, RECOMMENDED, 2 = NO, NOT RECOMMENDED, 8 = REFUSED, 9 = DON'T KNOW / DON'T REMEMBER] [DO NOT READ UNLESS RESP STRUGGLING WITH NAME OF UPGRADE; MULT RESP]

- a. High efficiency air to air heat (or air source) pump with electric backup
- b. High efficiency air to air heat (or air source) 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

14. Have you implemented any of the energy efficiency recommendations provided by the Energy Advisor?

1. (Yes, implemented at least one measure)
2. (No, have not implemented any measures)
8. (Don't Know)
9. (Refused)

15. [IF Q14 = 1] Which of the following recommendations have you implemented? [ASK FOR EACH ITEM IN Q13a THRU Q13l = 1] [1 = YES, IMPLEMENTED, 2 = NO, NOT IMPLEMENTED, 8 = REFUSED, 9 = DON'T KNOW]

- a. (High efficiency air to air heat (or air source) pump with electric backup)
- b. (High efficiency air to air heat (or air source) 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)

[IF Q14=1 AND FOR EACH Q15a thru i=1, ALSO Q0a thru i=1, SKIP TO Q21]

16. IF ANY Q13a thru l=1 and any Q0a thru l=2: Do you plan to install any of the other recommended upgrades in the future?

IF ALL Q0a thru l ≠ 1 OR Q14 = 2, 8, 9: Do you plan to install any of the recommended upgrades in the future?

1. (Yes, plan to implement all of the recommended measures) ---->SKIP TO Q18
2. (Yes, plan to implement some but not all of the recommended measures)--CONTINUE
3. (No, have no plans to implement any of the other measures) ---->SKIP TO Q19
8. (Don't Know) ---->SKIP TO Q19
9. (Refused) ---->SKIP TO Q19

17. Which of the following recommended upgrades do you plan to install in the future? [ASK FOR EACH ITEM IN Q15a THRU Q15l = 1 AND Q0a thru l≠1] [1 = YES, PLAN TO INSTALL, 2 = NO, DO NOT PLAN TO INSTALL, 8 = REFUSED, 9 = DON'T KNOW]

- 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)

18. [IF Q16=1 OR ANY OF Q17a thru l=1]: When do you plan to have these additional upgrades installed?

1. Within the next six months
2. Within seven to twelve months
3. More than a year from now
4. (Don't know)

19. [ISA: THIS QUESTION HAS THREE ALTERNATE WORDINGS DEPENDING ON PREVIOUS RESPONSES] [IF Q14 >= 2 AND Q16 >= 3] What is the ONE most important reason you are not planning to install any of the recommended upgrades?

[IF Q14 = 1 AND Q16 >= 3] What is the ONE most important reason you are not planning to install any of the other recommended upgrades?

[IF Q 14= 1 AND Q16 = 2] What is the ONE most important reason you are not planning to install some of the other recommended upgrades? [PROBE FOR SPECIFIC REASONS; ACCEPT ONE]

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. (Other: [SPECIFY: _____])
9. (No other reason)
88. (Don't know)
98. (Refused)

20. Are there any other reasons you're not planning to install these recommended upgrades in your home? [PROBE; MULT RESPONSE; SAME LIST AS ABOVE]

[IF IN SAMPLE FILE 'AUDIT STAGE' = 'D' SKIP TO Q27]

21. I am going to read you a list of electric space or water heating 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?

[1 = YES, RECOMMENDED, 2 = NO, NOT RECOMMENDED, 8 = REFUSED, 9 = DON'T KNOW/ DON'T REMEMBER; RANDOMIZE LIST]

- 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)

22. I am now going to read you a list of electricity related upgrades that, according to our records, were installed in your home. For each one, can you please confirm that THIS INFORMATION IS CORRECT AND THAT THE UPGRADE WAS INSTALLED? [READ WHAT IS ON RECORD] (1=YES, INSTALLED, 2=NO, NOT INSTALLED, 8=REFUSED, 9=DON'T KNOW / DON'T REMEMBER)

- 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 Q0 and Q24 IF FOR ANY ITEM IN Q21a thru i = 1 AND Q22a thru i≠1]:

23. So it seems that there were some recommended upgrades that you decided not to install. What is the ONE most important reason you decided not to install these recommended upgrades? [PROBE FOR SPECIFIC REASONS; ACCEPT ONE]

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)
9. (Other: [SPECIFY: _____])
10. (No other reasons)
88. (Don't know)
98. (Refused)

24. Are there any other reasons you're not planning to implement these recommended measures in your home? [PROBE FOR SPECIFIC REASONS; MULT RESPONSE; SAME LIST AS Q0]

ASK Q25 and Q26 IF Q0=8 OR Q24=8 AND FOR ANY ITEM IN Q21a thru l = 1, Q22a thru l≠1

25. Which of the following recommended upgrades do you plan to install in the future? [1 = YES, PLAN TO INSTALL, 2 = NO, DO NOT PLAN TO INSTALL, 8 = REFUSED, 9 = DON'T KNOW]

- a. (High efficiency air to air heat (oe air source) pump with electric backup)
- b. (High efficiency air to air heat (or air source) 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)

26. [IF ANY OF Q25a thru i=1]: When do you plan to have these additional upgrades installed?

1. Within the next six months
2. Within seven to twelve months
3. More than a year from now
8. (Don't know)
9. (Refused)

[ASK Q27 IF ANY Q0a thru l=1 or Q22a thru l=1]

27. How satisfied are you overall with the energy efficiency upgrades installed in your home? Would you say you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied with the energy efficiency upgrades installed in your home?

1. Very satisfied
2. Satisfied
3. Neither satisfied nor dissatisfied
4. Dissatisfied
5. Very Dissatisfied
8. (Don't know)
9. (Refused)

28. [IF Q27 = 4 or 5] What is the ONE most important reason that you're not satisfied with the energy efficient upgrades installed in your home? [PROBE FOR SPECIFIC REASON; ACCEPT ONE RESPONSE; RECORD VERBATIM – 7 = NO OTHER REASON, 8 = DK, 9 = REF]

29. [IF Q27 = 4 or 5] Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE; RECORD VERBATIM – 7 = NO OTHER REASON, 8 = DK, 9 = REF]

30. Are there any other energy saving upgrades that you made to your home IN ADDITION to what was recommended by the EnerGuide program? [LIST ANY MENTIONED]

- 1 _____
- 2 _____
- 3 _____

Section 4 – Free-ridership

FR1. Did you have any specific plans to pursue any of the recommended improvements that you have installed BEFORE talking with anyone about the EnerGuide for Existing Houses program? If yes, which ones did you plan to install?

1. (YES, planned to install a heat pump)
2. (YES, planned to install electronic thermal storage room units)
3. (YES, planned to install an electronic thermal storage furnace)
4. (YES, planned to install an electronic thermal storage central hydronic system)
5. (YES, planned to install programmable electronic thermostats)
6. (YES, planned to install drain water heater recovery)
7. (YES, planned to install a solar domestic water heating system)
8. (Yes, planned to install high efficiency ductless mini split heat pump)
9. (Yes, planned to install electric water heater tank insulation)
10. (Yes, planned to install water heater exposed pipe insulation)
11. (NO)
12. (Don't know)
13. (Refused)

FR2. Before your initial energy audit, had you contacted any contractors about any of the electric space or water heating equipment that you later installed as part of the EnerGuide for Existing Houses program?

1. (Yes)
2. (No)
8. (Don't know)
9. (Refused)

Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide Existing Houses Program. If you had not participated in the EnerGuide Existing Houses Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have... **[For FR3a-d 1 = YES, 2 = NO, 9 = Don't know; For FR3c if YES ask FR2ci]**

FR3a. Postponed making energy efficient upgrades to your home by more than one year

FR3b. Would not have made any energy efficient upgrades to your home

FR3c. Would have made fewer energy efficiency upgrades to your home

FR2ci. [If yes: Would you have made (i. Slightly, ii. Somewhat, iii. Significantly) fewer energy efficiency upgrades to your home?]

FR3d. Would have made the same amount of energy efficient upgrades as those made through the program

FR4.

Nova Scotia Power paid [\$XX – READ FROM SAMPLE FILE] for the energy efficient upgrades made to your home. If you had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades including the incentive?

1. Yes
2. No
3. (Don't know)

FR5. How influential were the following elements to your decision to install equipment or make energy efficiency upgrades as part of the EnerGuide Existing Houses program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program 'had no influence at all on your decision to participate in the EnerGuide Existing Houses program' and 5 indicates that the program was 'extremely influential to your decision to improve the energy efficiency of your home.' How influential was the:

Element (READ)	(a) Performance of Measure					
a. Program Incentives or rebates	1 No influence at all	2	3	4	5 Extremely influential	9 DK
b. Information or advice from the energy audit	1 No influence at all	2	3	4	5 Extremely influential	9 DK
c. Information, advice, or services provided by a contractor	1 No influence at all	2	3	4	5 Extremely influential	9 DK

[IF IN SAMPLE FILE 'AUDIT STAGE' = 'D' AND Q22a THRU I ≠1 SKIP TO Q37, OTHERWISE CONTINUE]

Section 4 - Impact of measures on comfort level and value of the program to customers

[IF ANY Q0a thru I=1 or Q22a thru I=1]

31. As a result of installing the energy efficiency measures recommended by the program has there been any change in the comfort levels inside your house for you or other occupants?

1. Yes
2. No
8. (Don't know)
9. (Refused)

32. IF Q31=1: What has been the change in comfort levels for you or other occupants in your house as a result of installing the energy efficiency measures recommended by 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
6. Other [SPECIFY _____])
8. (Don't know)
9. (Refused)

33. Overall how would you rate the value of the EnerGuide for Existing Houses program to you and other occupants of your home? On a scale from one to five, where one is LITTLE VALUE and five is IMMENSE VALUE, how would you rate the overall value of the program?

[ENTER VALUE] ____

Section 5 - Satisfaction with the effects of measures on their energy bills

34. How long has it been since you installed the energy efficient measures in your home?

1. Less than one month
2. One to six months
3. Seven months to a year
4. More than one year
8. Don't know
9. Refused

35. Since these measures were installed, what changes, if any, have you noticed in your energy bills?

1. Bills have gone down
2. Bills have gone up
3. No change in the bills
4. Hasn't been long enough to know
8. (Don't know)
9. (Refused)

36. IF Q35 <= 4: Can you tell me how satisfied you are with the impact on your energy bills of the energy efficiency upgrades you installed? 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
8. (Don't know)
9. (Refused)

Section 6 - Receptivity to other possible upgrades

37. 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)
8. (Don't know)
9. (Refused)

38. [IF Q37 = 1] Which energy efficiency upgrades would you like to have covered by the program? [PROBE FOR SPECIFIC UPGRADES; ACCEPT MULTIPLE]

Section 7 - Recommendations for program improvements

39. Do you have any recommendations for improving the EnerGuide for Existing Houses program?

Section 8 - Demographic characteristics**[ASK ALL RESPONDENTS]**

40. These final questions are asked for statistical purposes only. The information collected is strictly confidential.

41. 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)
6. Other [SPECIFY: _____]
8. (Don't know/refused)

42. How many bedrooms are in your home? [88=DK; Enter zero for a studio apartment with no bedrooms]

43. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home
7. (Other Specify _____)
8. (DK/RF)

44. 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]

45. What is your age? [DO NOT 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)

46. 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)
- 9 (Refused)

47. Which of the following income categories best describes your total annual household income before taxes in 2008? 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
8. (Refused)

48. [DO NOT READ] Gender

1. Male
2. Female

[READ: THAT IS ALL THE QUESTIONS I HAVE FOR YOU. THANK AND TERMINATE.]

Appendix B Interview Guides

Staff Interview Guide for EnerGuide Existing Houses

Date:

Name:

Programs responsible for:

Introduction:

[This interview should take about an hour]

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:

We'd like to start by confirming a few things about your role with the program:

1. What percentage of your time do you spend on [EACH PROGRAM]?
What, if any, are the responsibilities of other NSPI staff members for [EACH PROGRAM]?
2. In our preliminary interview you identified the following groups and individuals that you interact with as part of the [program]...
 - a. EnerGuide Existing Homes program
 - i. Conserve Nova Scotia
 - ii. Delivery agents
3. In general, have your interactions with these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
4. Do these programs run year round or do they start and end during the year? What is the period of the program? When did it start? When will it end?
5. What are the 2010 energy savings goals for [PROGRAM(s)]? Do you think you will achieve these goals?
6. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program(s) this year?
 - a. Again at the broadest level, what were the areas that were not so successful?

- b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?

Theory and Logic Model Review:

7. Does the program have an explicit program theory and logic model?
8. In general, how would you characterize the overall goals of the program—would you say that the program is primarily a Resource Acquisition program, where the focus is on delaying or displacing new power plant construction through demand reduction? Or would you say the program is primarily a Market Transformation program, where the focus is on changing practices and building adoption, and ultimately effect changes in NS provincial energy standards? Or is it a combination of the two? Why?
9. What are the major components and activities of the program, and what are they intended to accomplish?
 - a. In the short term?
 - b. Intermediate term?
 - c. Long term?
10. What are the key outputs from each activity?
11. Is there any sequence to these activities, outputs, or outcomes? Are there any of these that need to happen before another takes place? Are there any casual relationships between these activities, outputs, and outcomes?
12. How do you expect to measure the extent to which program goals have been accomplished—that is, what are the indicators for the outcomes you expect to achieve? Short-term? Intermediate? Long-term?
 - a. Are there any key indicators or metrics to gauge program effectiveness and success in short-, intermediate-, and long-term?
13. What are the assumptions behind the expectations that the program activities will yield the outputs and outcomes, which in turn will help achieve program goals? Assumptions could include:
 - a. Availability of resources and skill sets to organize and manage the program at NSPI
 - b. Availability of resources and skill sets to organize and implement the program at NSPI and / or implementation contractors
 - c. Level of customer motivation and receptivity to program
 - d. Value and effectiveness of program marketing, outreach, and education materials and activities to motivate customers to consider and participate in the program
 - e. Program features that will help overcome barriers to participation
 - f. Value and benefit of the program to any implementation contractors to motivate them to participate in and promote the program
 - g. Characteristics of target customers that make them the appropriate target for the program
 - h. Customer energy usage and operational characteristics that will result in the achievement of program goals by the implementation of the program measures
 - i. Effectiveness of the measures in helping achieve program goals

14. Who are the key program targets? What do you think are their primary motivations for participating in the program? What are the major barriers to their participation in the program?
15. What has changed about the program since the beginning, and why?

Marketing and Verification:

16. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
17. Overall, how successful has each program been so far? Why / Why not?
18. What do you think is particularly good about program delivery of each program? How could program delivery be improved?
19. Are there any safeguards to prevent free-ridership in the EnerGuide programs? What are they?
20. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?
 - a. What, if any, impact has there been to the technologies covered by [program] due to Conserve Nova Scotia moving away from offering incentives for electric measures?
 - b. Are there gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by NSPI programs or any other programs? What could be done to address those gaps?

TIME PERMITTING: Review of 2009 Recommendations:

21. I am going to review some of the evaluation recommendations from 2009. For each one, please indicate whether the recommendation was considered or adopted? And, if not, why not? [SEE NEXT PAGE FOR RECOMMENDATIONS]

Strengths and Weaknesses / Wrap-up:

22. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
23. Based on your experience with the program(s) so far, what are the most important improvements that still need to be made to the program?
24. Are there any other program issues we have not discussed that you would like to mention?
25. We are planning on conducting interviews with [below] are there any other individuals or groups we should speak to about the program?
 - a. Outreach Agent
 - b. Delivery agents

Thank You

Interview Guide for EnerGuide for Existing Houses Delivery Agents Primary Contact

Date:

Name:

Organization:

Introduction:

[This interview should take about 30 minutes]

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:

We'd like to start by confirming a few things about your role with the program:

1. Please describe [ORGANIZATION NAME] responsibilities for the EnerGuide for Existing Houses Program.
2. Tell me about any formal or informal training you've had that helped prepare you for your work in this program. What kinds of certifications do you have? What kind of training, if any, did Conserve Nova Scotia or Nova Scotia Power provide you?
3. What training has been most helpful for your work with program? What training has been least helpful?
4. Do you feel additional training would be helpful? What kind?
5. What do you see as the main goals of the EnerGuide for Existing Houses Program?
6. Does [ORGANIZATION NAME] have specific goals for the 2009 EnerGuide for Existing Houses program? What are they? [PROBE IF NOT MENTIONED; are there also any energy savings goals? IF NOT MENTIONED; are there also any participation goals?] Do you think you will achieve these goals? Why? Why not?
7. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED: How frequently are you in contact with Jordan Dorey, the program manager at Nova Scotia Power? What is the nature of these interactions? How frequently are you in contact with the program manager at Conserve Nova Scotia? What is the nature of these interactions? Do you have any contacts with Natural Resources Canada, the Federal administrator of the EnerGuide Program? IF YES: How frequently and what is the nature of these interactions?]
 - a. Ask [Name of DA-4] : We understand that [Name of DA-4] also is a delivery agent for the EnerGuide for New Houses program. Are there any efficiencies derived from being a delivery agent for both programs? We also understand that [Name of DA-4] has a separate program manager for the New Houses program and that you (President of [Name of DA-4]) manage the Existing Houses program. Is this correct?

IF NO: who is the [Name of DA-4] program manager for the Existing Houses program? We understand, however, that you serve as the primary contact at [Name of DA-4] for the

Existing Houses program. Why is it that you are the primary contact for the Existing Houses program but have a separate program manager for the New Houses program? To what extent does handling the management and communications for the Existing Houses program impact your other responsibilities as President of [Name of DA-4]?

IF YES: Why is it that you are the manager for the Existing Houses program but have a separate program manager for the New Houses program? To what extent does handling the management and communications for the Existing Houses program impact your other responsibilities as President of [Name of DA-4]?

8. What other organizations and individuals, do you interact with for this program? What is the nature of these interactions? How frequently are you in contact with them?
9. In general, have your interactions with all of these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
10. Describe how you are paid for your work on the program. Are the payments timely? How might the reimbursement process be improved?
11. In what ways has participating in the EnerGuide for Existing Houses Program helped [ORGANIZATION NAME]? [PROBE: increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc.]
12. About what percentage of [ORGANIZATION NAME] business is driven by the EnerGuide for Existing Houses Program?
 - a. IF 50% OR MORE: Is the amount of work that you receive from the program enough to keep you busy all year, or just at some times of the year? What times are you not busy enough? How does this affect your business?
13. Would you be able to handle more business from the program if it became available?

Program Tracking and Reporting

14. Please describe the tracking and reporting data you provide for the EnerGuide for Existing Houses Program. In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the EnerGuide for Existing Houses Program is spent on fulfilling data tracking requirements? [PROBE IF ISSUE IS NOT BROUGHT UP: What tracking and reporting data do you provide specifically regarding electric measures that are rebated by Nova Scotia Power? In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the EnerGuide for Existing Houses Program is spent on fulfilling data tracking requirements specifically for electric measures rebated by Nova Scotia Power?]
15. In general, how well do you think the program tracking and reporting process is working? Do you believe all the necessary data is being captured and passed on to Conserve Nova Scotia? To Nova

Scotia Power? If not, what data should be captured? Do you think the data is being captured and communicated in the most efficient possible way? IF NO: How could the data capture and communication be improved?

16. [IF NOT MENTIONED ABOVE] Do you maintain data on the specific measures implemented at each home, along with measure specific costs and savings estimates? Is this data in hardcopy or computerized?
17. Are there any improvements you would like to see in the data tracking process that we have not already discussed? If yes, what are they?

Program Delivery Process

18. Please describe the program delivery process, starting with the customer's first contact with you. What is the timing for each step in the delivery process; for example, how long does it take to complete the pre-retrofit audit (D audit), provide information to the customer, install recommended measures, post-retrofit audit (E audit), receive rebate cheques?
19. Are there any factors inhibit your ability to effectively perform any part of the program delivery process? IF YES: What are they? How can these be addressed? What impact do you think addressing them will have on your effectiveness and on the program overall?
20. What impact, if any, has the entry of Nova Scotia Power into the program had on the program delivery process?
21. For customers who drop out after the first audit: why is it that these customers do not go on to any implement recommended measures? After the first audit, do you have any follow-up actions to encourage them to implement recommended measures? What is timing and frequency of these follow up actions? How successful have they been? Is there anything else that can be done to encourage these customers to implement recommended measures?
22. For customers who go on to do the final audit, typically, how soon after the first audit do they implement the measures and how much time after the first audit does the post-retrofit audit take place? Typically, what percentage of the recommended measures do these customers implement? Approximately, what percentage of the recommended savings are realized? Are there some measures that customers implement more often and others that they implement less often? What are they? Why does that happen? What can be done to encourage customers to implement all of the measures / the measures that are implemented less often?
23. Do you know if the program has had any impact on the stocking practices of equipment vendors? IF YES: In what way?
24. In general, which parts of the program process do you think work particularly well? Why? Which parts work less well? Why?
25. Do you have any other suggestions for improving the program delivery process?

Customer Issues

26. In general, how aware and knowledgeable are consumers in your service territory about the program? How important do you think it is to increase consumer awareness levels about the program? Why do you feel this way? What do you think should be done to increase consumer awareness levels? What do you think are the key messages to communicate regarding the program?
27. Do you provide a list of contractors to the customer after the pre-retrofit audit? [PROBE: If not, do customers ask for recommendations or information on contractors who can implement recommendations presented in the audit?]
28. How have most of the homeowners you serve found out about the program? What are other ways they have learned of the program?
29. Do you do outreach to identify potential customers? How does this work? Do you have access to adequate materials and information for customer presentations and meetings?
 - a. [PROBE IF NOT MENTIONED: Do you engage in any marketing activities to attract potential customers to the program? Who is targeted in your marketing? How do you market to them specifically? Do you have access to adequate materials and information for customer presentations and meetings?]
30. Are there any customer segments who have really low participation in the program? Why?
31. Why do you think most customers participate in the program? What other reasons drive participation?
32. What keeps customers from participating in the program?
33. What impact, if any, has the entry of Nova Scotia Power into the program had on customer awareness and/or response to the program? Has there been any impact on customers of the additional electric measure rebates from Nova Scotia Power?
34. How does the pre-retrofit evaluation serve the customers' needs? How often does the information provided confirm what they already know about their homes? How often does it lead them to consider measures they were unaware of?
35. Have you received any complaints or other signs of customer dissatisfaction with the program? If yes, what was involved? If yes, how frequent is this?
36. Are there any other barriers that prevent customers from participating in the program? How satisfied do you think customers are overall with the program? What feedback have you received from customers once the work on their homes is completed? Do you believe this program provides good value to customers?

Strengths and Weaknesses / Wrap-up:

37. What would you say are the program's greatest strengths? And what would you say are the program's greatest weaknesses? What could be done to address these weaknesses?
38. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
39. Are there any other program issues we have not discussed that you would like to mention?
40. We also would like to complete an in-depth interview with one of the energy advisors who works for [ORGANIZATION]. Can you provide me with contact information for an energy advisor?



Impact and Process Evaluation: Low Income Households Program 2010

February 25, 2011

Final Report

Submitted to:

Efficiency Nova Scotia Corporation

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Executive Summary

This report presents the results of the 2010 process and impact evaluation of the residential Low Income Households program (LIH) conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation. The 2010 LIH program was administered by Conserve Nova Scotia (CNS), which calls it the Residential Energy Affordability Program (REAP), and is funded by CNS, the DSM Administrator, Natural Resources Canada (NRCan), and ecoNova Scotia.¹ The process evaluation was based on in-depth interviews with DSM Administrator staff and the implementation contractors as well as telephone surveys with program participants. The interviews conducted with program staff and contractors covered a variety of program topics including goals, theory, structure, design, delivery, roles of individuals and marketing. The telephone survey was conducted with a sample of sixty-two program participants.

Impact Evaluation Findings

The impact evaluation of the 2010 LIH program was based on a billing analysis of participants and a control group of nonparticipants. The analysis also included reviews of a sample of LIH HOT2000 reports and savings estimates from similar programs in other jurisdictions. Based on this evaluation, the NMR team estimates that the generator-level impacts for LIH program in 2010 are 895.4 MWh of energy savings and 199.2 kW for demand savings.² These savings fell short of the 2010 program's energy savings goal of 5,260 MWh, and its demand savings goal of 1,170 kW.³ The estimates of evaluated impacts are presented in Table 1.

Table 1: 2010 Program Savings Summary

	Peak Demand (kW)	Energy (MWh)
Net annual savings at generator	199.2	895.4

Findings and Recommendations

The LIH program uses three primary REAP Delivery Agents who implement the program. Each Delivery Agent employs or subcontracts with Energy Advisors who are certified to perform on-site energy audits and obtain EnerGuide ratings for each home. The DSM Administrator, CNS program manager, and the Delivery Agents interviewed thought that the program delivery process generally runs smoothly. The large majority of respondents (90%) to the participant survey were satisfied with the program overall. Three out of five survey respondents (61%) reported improved comfort levels in their homes and two out

¹ The Conserve Nova Scotia organization will shut down in 2011.

² Note that we also developed an alternative estimate of savings based on data from Conserve Nova Scotia on space heating fuel costs. This estimate was higher than the evaluated savings: 1,264 MWh for energy savings and 281.2 kW for demand savings.

³ One factor that may have contributed to falling short of goals is that, in early 2010, CNS had a delay in REAP IV contract execution. This resulted in delays in implementation and delivery of the program. Note additionally that these savings are comparable to the savings from similar programs in other jurisdictions.

of five (40%) reported that the program measures had reduced their energy bills (40%). Three out of five respondents (60%) reported behavior changes such as turning off lights and lowering thermostat levels and almost one-half reported increased knowledge of energy efficiency (46%). This evaluation identified opportunities to improve program design, marketing and communications. The major survey findings and recommendations are provided below.

Program Outreach and Marketing

Finding	Recommendation
LIH-F1. Although the participant sourcing process worked effectively, the flow of names of prospective participants that came from CNS, via the Nova Scotia Department of Community Services and Service Nova Scotia and Municipal Relations was insufficient. The Outreach Agents reported falling short of their goals for number of participants recruited into the program. This resulted in a lack of consistent work for the Delivery Agents and led to inefficiencies in the delivery process.	LIH-R1. Increase program marketing and outreach efforts to assure a steady, consistent flow of prospective participants. The program should consider expanding to include the rental/multi-unit residential building (MURB) market.
LIH-F2. Both of the Outreach Agents believe that they could recruit a significantly greater number of participants if the income eligibility threshold were increased, particularly for rural areas.	LIH-R2. Evaluate the possibility of raising the income eligibility threshold for rural areas. Increasing the pool of potential participants in sparsely populated areas will also provide the added benefit of allowing Delivery Agents to more cost-effectively serve those areas through increased efficiencies of time and travel expenses.
LIH-F3. One in three respondents (34%) to the participant survey reported first learning about REAP from outreach activities: a letter (19%) or a direct telephone contact (15%). Few survey respondents reported learning about the program from the newspaper (5%) or advertisements (3%). Both the Delivery Agents and Outreach Agents reported that customer awareness regarding REAP was low. Both of the Outreach Agents believed that incorporating an advertising budget into the program would allow them to recruit more participants. One Delivery Agent would like to see the program increase its advertising in avenues such as local newspapers in order to enhance customer awareness.	LIH-R3. Consider increasing targeted media advertising of the program. The use of direct contact outreach methods generally limit recruitment to one customer at a time and the program should consider more mass media approaches such as newspaper or other media advertising.
LIH-F4. Customers were motivated to participate in the program primarily because of energy savings and the associated financial benefit—48% were motivated by saving on energy costs/bills. Among the few respondents who had concerns about participation, most were skeptical that the program was in fact free.	LIH-R4. Continue to promote the savings benefits of the program with an emphasis that the program is truly free of charge

Program Outreach and Marketing (continued)

Finding	Recommendation
LIH-F5. Participation in the program resulted in 40% of the respondents reporting a reduction in their energy bills. Ten participants mentioned an average monthly savings of \$42. Approximately seven out of ten (72%) were satisfied with the savings from the program measures.	LIH-R5. Prospective participants should be made aware of the relationship between the measures installed by the program and future cost savings.
LIH-F6. Installed measures had a positive impact on comfort level. About three out of five respondents (61%) reported that their comfort level in the house had improved. After measures were implemented, about four out of five respondents noticed fewer drafts (80%) and consistent temperatures throughout the house (79%).	LIH-R6. Also emphasize to participants that the energy saving measures not only provide savings benefits but also improve comfort levels in the home.
LIH-F7. Nearly all of the respondents (97%) also reported that they would recommend the program to a friend or family member and more than four out of five respondents (83%) reported that they actually have recommended the program to a family member or friend. However, only about one in eight participants (13%) reported that they found out about the program through word-of-mouth.	LIH-R7. As an additional participant recruiting mechanism, the program may want to consider offering a further incentive to participants for recommending the program to their friends and family.
LIH-F8. The DSM Administrator (via CNS) worked effectively with SNSMR (Service Nova Scotia and Municipal Relations (SNSMR) to identify income eligible electrically heated households from the pool of low income applicants to the Heating Assistance Rebate Program. SNSMR collects data on the home heating source, income, and address of applicants to the Heating Assistance Rebate Program.	LIH-R8. Identifying eligible participants through the partnership with SNSMR is efficient and cost-effective. The DSM Administrator should continue to utilize this resource.
LIH-F9. There is a misperception amongst delivery agents, that only homes that required significant building envelop upgrades were eligible for the program, which led one of the Delivery Agents to think that the number of homes that were not properly screened had increased since 2009.	LIH-R9. Training and communications of Delivery Agents should clearly explain the eligibility requirements for electrically heated homes in the program.
LIH-F10. The expectations of participants recruited by the Outreach Agents are higher than those recruited through the other channels. Specifically, homeowners recruited through the outreach channel more often lacked understanding of the audit process and believed with certainty that the program would provide them with a new refrigerator, freezer, and/or a certain amount of insulation. On the other hand, one of the Outreach Agents received phone calls from some participants complaining that the Delivery Agents had led the participants to believe that they would be receiving a new appliance when in fact they were not.	LIH-R10. Provide clear guidelines to all program delivery personnel involved in customer contact regarding setting customer expectations from the program. Develop printed leave behinds that clearly describe what the customer should and should not expect from the program.

Program Outreach and Marketing (continued)

Finding	Recommendation
LIH-F11. Participants who apply to the program through the Outreach Agents are sent a letter informing them that they will receive a welcome letter from CNS in several weeks. However, the Outreach Agents reported process delays of five to six months.	LIH-R11. Reduce time from participant recruitment to first contact. The Outreach Agents should be in direct contact with the program administrator regarding applicant follow ups. Set a goal of first contact within four to six weeks.

Program Delivery Structure and Design

Finding	Recommendation
LIH-F12. The LIH the program is not consistently referred to by the same name throughout the program delivery process. Outreach Agents referred to the program as the Nova Scotia Low Income Households program when they recruited participants. However, the welcome letter that CNS sent participants referred to the program as REAP. One of the Outreach Agents reported that on more than one occasion, customers had contacted her to follow up on the status of their applications, when in fact they had been sent welcome letters from CNS but had failed to recognize them as the program to which they had applied. In addition, The Outreach Agents reported customer confusion between the REAP program and EnerGuide for Existing Houses program.	LIH-R12. The DSM Administrator should establish a single name for the program that is consistently used by everyone involved in program delivery. This is important not only for eliminating customer confusion or misunderstanding but also for building a differentiated brand identity.
LIH-F13. The number of Delivery Agents decreased from four to three in 2010. The region formerly serviced by the Delivery Agent that was unsuccessful in the bidding process was taken over by two of the three Delivery Agents.	LIH-R13. The DSM Administrator should continue to monitor the delivery process in all regions in order to ensure that resources are sufficient to carry out the program as designed.
LIH-F14. The Delivery Agents reported that the protocol for replacing refrigerators and freezers was burdensome and that they were not properly equipped to determine the age of participants' old refrigerators and freezers.	LIH-R14. The DSM Administrator should review and update the guidebook for determining the manufacture date of refrigerators and freezers. This guidebook should be reviewed with Delivery Agents to ensure that it will meet their needs. Also, some programs use the serial number of the appliance to determine the date of manufacture. The Program Administrator may want to consider using this approach.
LIH-F15. Program staff discussed separating Scope I and Scope II audits as a means of increasing the cost effectiveness of the overall program. Delivery Agents would visit homes to perform Scope II upgrades only. While performing the Scope II upgrades, Delivery Agents would identify and record the homes with the greatest potential energy savings from Scope I measures.	LIH-R15. Before implementing any significant changes to the program design, the DSM Administrator should carefully consider the ramifications of the change both from a logistical and financial perspective. Include the Delivery Agents in the determinations regarding making such a change.

Program Delivery Structure and Design (continued)

Finding	Recommendation
LIH-F16. As reported in the 2009 evaluation, the LIH program tracking information did not include a unique identifier for either participants or prospective participants. At no point during the recruiting process or customer screening were customers assigned a unique identifier.	LIH-R16. The DSM Administrator should introduce a unique identifier as early in the customer recruitment process as possible. The unique identifier should also include a field to identify the source of participant name, e.g., DCS, Outreach Agent, SNSMR, etc.
LIH-F17. As reported in the 2009 evaluation, the Delivery Agents submit monthly reports to CNS including Scope I and Scope II upgrades. Contractors submit invoices at the end of each month to CNS. Based on examination of program tracking records, it appears that Delivery Agents currently submit partial invoices and invoice separately for Scope I and Scope II measures. Multiple invoices can add to the overall time taken to complete paperwork for the program.	LIH-R17. The DSM Administrator should consider requiring Delivery Agents to submit only one invoice for each home. This will require that Delivery Agents complete all work associated with a home before submitting an invoice.
LIH-F18. The communication lines stayed open between the Outreach Agent and the participants they recruited, but not between the participants and CNS. Both of the Outreach Agents reported instances in which they had passed along suggestions, concerns, or customer complaints to the DSM Administrator and CNS program managers but received no resolution regarding the issues. In addition, the Outreach Agents were not regularly updated with information regarding delays in the application process or the status of individual complaints. However, participants continued to view them as a source of information and may have contacted them for information to which they had no access.	LIH-R18. Integrate Outreach and Delivery Agents as full partners in program delivery. Establish a feedback loop for Outreach and Delivery Agents so that they can stay updated on the status of applications, the progress of work on participant homes, and the response to any participant issues or complaints. This might possibly be accomplished by providing access to an online data tracking system.
LIH-F19. As reported in the 2009 evaluation, while the DSM Administrator was receiving the proper information, it seems that it was receiving this data in varying formats. Furthermore, the DSM Administrator also used a spreadsheet to maintain and track program participation records.	LIH-R19. Provide a standardized data entry form to all Delivery Agents. If possible, transition program data tracking to an online system that can also be accessed by Delivery Agents.
LIH-F20. Some respondents reported a substantial discrepancy between the measures that were recorded as having been installed and what they thought actually was installed. In particular, verification of building envelope measures decreased from 95% in 2009 to 77% in 2010. These low levels of verifiability could be due to poor respondent recall or could indicate that the Delivery Agents had not installed all of the measures identified in the tracking records.	LIH-R20. Continue to require the Delivery Agent to walk participants around their homes after installation is complete and attest to the installation of each measure

Program Delivery Structure and Design (continued)

Finding	Recommendation
LIH-F21. Quality control activities increased in 2010 with the inspection of forty retrofitted homes (ten from each service territory) by third-party contractors, and with the implementation of the requirement that participants sign off on the measures installed after the work has been performed.	LIH-R21. Also utilize the results of quality control activities to identify and address potential discrepancies in measures reported to have been installed by Delivery Agents.

Behavior Changes and Satisfaction

Finding	Recommendation
LIH-F22. Three out of five respondents (60%) reported that after receiving information from the energy audit, there was a change in their behavior with regard to their use of energy at home: 51% now turn off lights where they might not have before and 22% set the thermostat lower. Around three out of five reported more interest in energy efficiency (61%) and almost one-half reported increased knowledge of energy efficiency (46%).	LIH-R22. Education of low-income consumers on continued energy efficient practices offers a payback in energy savings long after a customer participates in the program. Focus on improving the energy efficiency interest and knowledge of participants by providing educational materials.
LIH-F23. Overall satisfaction with the program was high (90%). At least eight out of ten respondents were satisfied with each aspect of the program. However, satisfaction with several program aspects decreased between 2009 and 2010. Satisfaction with the energy conservation measures installed decreased from 93% to 81%. In addition, satisfaction with the energy efficiency presentation decreased from 95% to 84%. Lastly, satisfaction with the quality of the work completed declined from 95% to 81%. While about one out of four respondents (24%) offered a recommendation to improve the program, the top recommendation offered by respondents was to improve the quality of work (5%).	LIH-R23. The program has been successful as measured by perceived satisfaction to participants. The DSM Administrator should continue to monitor customer satisfaction, particularly with regards to the energy conservation measures installed, the energy efficiency presentation, and the quality of the work completed.

1 Program Description and Data Tracking

1.1 Program Description

The 2010 Low Income Housing (LIH) program was administered by Conserve Nova Scotia (CNS),⁴ which called it the Residential Energy Affordability Program (REAP); and was funded by CNS, the DSM Administrator, Natural Resources Canada (NRCan), and ecoNova Scotia. Note that REAP is the name of the program at CNS, the primary program administrator, and also is the name by which it is most familiarly known to program contractors and customers. The program structure was largely unchanged from 2009. Notable changes in administration included the addition of an Outreach Agent and the reduction in the number of Delivery Agents from four to three. Furthermore, in 2010 CNS utilized home heating assistance applicants to Service Nova Scotia and Municipal Relations (SNSMR) as an additional source of potential participants to supplement the referrals from the Department of Community Services' (DCS) that it has traditionally utilized. CNS also implemented third-party inspections of a sample of retrofitted households in 2010. Finally, several changes to the program delivery process were implemented in 2010, including a new protocol for replacing refrigerators and freezers.

The LIH program was designed to offer assistance to lower-income homeowners in Nova Scotia in need of energy efficiency upgrades. The DSM Administrator used the established network of CNS Delivery Agents and Energy Advisors to complete electrically-heated home retrofits and achieve energy savings for the program. CNS and the DSM Administrator worked in partnership to deliver the overall program to low income households. For 2010, the LIH program had a goal of supporting activities in 875 homes with energy and demand savings targets of 5.26 GWh and 1.17 MW.

CNS used the DCS' four regions for allocation of the REAP funds. The regions were:

- Western region including the Lunenburg, Queens, Shelburne, Yarmouth, Digby, Annapolis and Kings counties;
- Central region including the Halifax Regional Municipality and Hants county;
- Northern region including Cumberland, Colchester, Pictou, Antigonish and Guysborough counties;
- Eastern region including Richmond, Inverness and Victoria counties and the Cape Breton Regional Municipality.

The program typically targets older homes with low-income owners, addressing building envelope, water-saving and electricity-saving measures. Building envelope and water-saving measures were not eligible for funding from the DSM Administrator except in the cases of electrically-heated homes and homes with electric hot water heating. Homes with partial electric heat, such as electric baseboards in some rooms, may have been eligible for funding of measures specific to those rooms, such as programmable thermostats and a related percentage of building envelope upgrades. Building envelope and water-saving measures included the following:

⁴ The Conserve Nova Scotia organization will shut down in 2011.

- Insulation of basement and/or crawlspaces, exposed floors, main walls and attics/ceilings;
- Draft-proofing areas such as windows, doors, attic hatches, electrical outlets, basement sill areas and other major sources of drafts in the home;
- Installing programmable thermostats;
- Providing ENERGY STAR-rated dehumidifiers and removing older, inefficient dehumidifiers where applicable;
- Installing carbon monoxide detectors;
- Installing low-flush toilets;
- Installing low-flow showerheads and faucet aerators in homes with non-electric water heating;
- Installing draft proofing items such as foam gaskets and child safety plugs for outlets.
- Additional upgrades that are required due to other upgrades installed by the program. For example, bathroom fans are installed to help reduce moisture levels in homes that have draft proofing measures installed.

Electricity-saving measures eligible for funding from the DSM Administrator included:

- Insulation of basement and/or crawlspaces, exposed floors, main walls and attics/ceilings in electrically heated homes;
- Draft-proofing areas such as windows, doors, attic hatches, electrical outlets, basement sill areas and other major sources of drafts in an electrically heated home;
- Installing programmable thermostats for use with electric baseboards;
- Providing ENERGY STAR-rated dehumidifiers and removing older, inefficient dehumidifiers where applicable in electrically heated homes;
- Replacing incandescent light bulbs with CFLs;
- Replacing halogen torchiere floor lamps with CFL-compatible fixtures;
- Replacing high-wattage lighting fixtures with CFL-compatible fixtures;
- Replacing inefficient or unsuitable outdoor porch lights with CFL-compatible fixtures;
- Installing insulating blankets on electric hot water heaters;
- Installing insulating pipe wrap on exposed pipes (electric hot water);
- Installing low-flow showerheads and faucet aerators in homes with electric water heating;
- Replacing eligible older refrigerators and/or freezers with ENERGY STAR-rated appliances, including the removal and disposal of old units;
- Installing power bars;
- Providing electric kettles to homeowners, where warranted;
- Having a presentation and discussion with each family on energy efficiency education; homeowners also receive a Quick Tips brochure.
- Additional upgrades that are required due to other upgrades installed by the program. For example, bathroom fans are installed to help reduce moisture levels in homes that have draft proofing measures installed

In order to facilitate implementation of the 2010 program, CNS contracted with three service providers.

1.1.1 Program Theory

Program Background

The LIH program is a Resource Acquisition program. As a Resource Acquisition program, LIH's primary goal is to increase the energy efficiency levels of low-income customer-owned households in Nova Scotia. The program takes a whole-house approach to energy upgrades. In order to ensure that funds are distributed based on electric savings, energy efficiency measures are divided into two categories: Scope I measures include mainly building envelope upgrades and Scope II measures include mainly prescriptive upgrades such as installing CFLs, insulating hot water tanks and piping, installing low-flow shower heads and faucet aerators, providing power bars to facilitate reduction in standby loss, providing electric kettles and replacing eligible freezers and refrigerators with ENERGY STAR models. The DSM Administrator pays for Scope I measures in electrically heated homes only.

CNS identifies potential REAP participants from several sources, including low-income applicants to DCS for emergency home repairs and applicants to Service Nova Scotia and Municipal Relations (SNSMR) for home heating assistance. Individuals referred through DCS and SNSMR can be either electric or non-electric space heating participants. Additionally, the DSM Administrator acquired the services of two outreach agents who network with community organizations that serve low-income households to enlist only electrically heated homes. Lists of potential participants are provided to CNS, and subsequently to the Delivery Agents serving the particular region. Homeowners on the list receive letters from CNS explaining REAP and the process. Contractors contact the homeowners, collect signed waivers and conduct an EnerGuide for Houses evaluation. Contractors then prepare a detailed renovation plan including photographs of areas of homes requiring upgrades and the proposed costs for each upgrade for those homes considered to have enough potential for energy efficiency upgrades. Once CNS has approved the renovation plan, the contractors are responsible for implementing the upgrades. Each homeowner must participate in an educational discussion with contractors to discuss the upgrades as well as other tips for reducing energy usage. Homeowners must also sign off on the measures installed once the work has been completed. A final EnerGuide for Houses evaluation is performed once all of the upgrades are complete.

Program Activities

- **Delivery Agent Recruitment and Training.** CNS recruits Delivery Agents for REAP through a standard provincial government request for Proposals (RFP) process.
- **Energy Evaluator Training.** Delivery Agents hire and train energy evaluators, who must be trained to provide EnerGuide for Houses evaluations.
- **Marketing, Outreach and Customer Screening.** CNS receives referrals from DCS for each of the four regions. DCS receives applications from people who need health and safety repairs for their homes, such as repairing roofs or furnaces. DCS visits these households and qualifies them as low-income. CNS also receives referrals from SNSMR which receives applications from people applying for the Heating Assistance Rebate Program. SNSMR verifies eligible households and sends applications to REAP. The Outreach Agents identify participants from a broader participant pool outside of customers who work with DCS and SNSMR. The Outreach Agents travel throughout the province distributing marketing materials and recruiting potential participants.

- **Pre-Retrofit Evaluation.** The Delivery Agents contact homeowners, collect signed waivers, and conduct an EnerGuide for Houses evaluation. The Delivery Agents then prepare a detailed renovation plan including photographs of areas of homes requiring upgrades and proposed costs for each upgrade.
- **Renovation Plans Approved.** CNS approves renovation plans submitted by Delivery Agents.
- **Retrofit Activities.** The Delivery Agents implement the approved upgrades from the renovation plans.
- **Educational Discussion.** Each homeowner participates in an educational discussion with contractors to discuss the upgrades as well as other tips for reducing energy usage.
- **Verification of Measures Installed.** Homeowners sign off on the measures installed in their homes. The Delivery agent conducts (or arranges) a follow-up EnerGuide for Houses evaluation once the upgrades are complete.
- **Quality Control.** A sample of participating homes is inspected by third-party contractors.
- **Data Collection.** Where possible, CNS and the DSM administrator access pre- and post-retrofit energy data from homeowners' energy providers. CNS obtains permission to access this data via a waiver before program participation.

Program Assumptions

- **Marketing and Outreach.** DCS, SNSMR, and the Outreach Agents are appropriate and sufficient sources of potential program participants. DCS deals primarily with low-income households with houses that have health or safety problems, SNSMR deals primarily with low-income households that need help paying for heating, and the two Outreach Agents cover the entire province.
- **Adequate Availability of Delivery Agents.** CNS will recruit a sufficient number of Delivery Agents to provide services throughout the province.
- **Sufficient Training to Delivery Agents.** Sufficient training is provided to Delivery Agents to perform EnerGuide Energy evaluations.
- **Skills and Equipment.** Delivery Agents have the equipment, tools and skills required to complete evaluations as part of the program or they can contract for such services.
- **Existence of Financial Constraints.** Program participants are financially constrained and unable to make investments in their homes to reduce their energy usage.
- **Potential Participants Agree to Participate.** Potential participants contacted by the Delivery Agent agree to participate in the program.
- **Energy Savings.** Participants will experience reduced energy use which will result in lower energy bills.

Program Barriers

- **Mistrust.** Potential participants may not believe that the program is offered for free.
- **Information Sharing.** Due to privacy concerns, participant information is not shared freely between the national and provincial governments and the DSM Administrator.
- **Lack of Comprehensive Participant Pool.** Many potential program participants may be overlooked because they have not applied to the DCS for emergency house repairs, or to SNSMR for heating assistance, or have not been identified by the Outreach Agents.

Short-Term Outcomes

- **Customers learn about energy use in their homes.** The one-on-one discussions with the program contractors about energy usage in participants' homes helps inform them about what they can do to decrease their energy costs.
- **Delivery Agents install energy saving measures.** Participants are able to increase the energy efficiency of their homes with upgrades that they would not have been able to afford on their own.

Mid-Term Outcomes

- **Participants are more knowledgeable about energy efficiency.** The educational discussion and new energy-efficient equipment in their homes help to increase the understanding of energy efficiency among participants.
- **Assist low-income customers.** Low-income customers enjoy the comfort and quality of life benefits of having better and newer equipment and measures installed in their homes.
- **Energy savings and bill reductions.** Energy savings result from the upgrades installed in homes with low-income owners.
- **Increased confidence in energy savings estimates.** Based on their experience with the Low Income Households program, low-income homeowners will have confidence in energy savings estimates for energy efficiency improvements.
- **Increased awareness of the LIH program in Nova Scotia low-income population.** Through word-of-mouth and other channels, awareness of the LIH program and its benefits spreads among the low-income residents in Nova Scotia.
- **Increased receptivity to the LIH program in Nova Scotia low-income population.** As a result of the increased awareness of the LIH program and its benefits, more low-income residents in Nova Scotia agree to participate in the LIH program when contacted by the program Delivery Agents.
- **Increased number of contractors.** As the program matures, there will be an increased number of program contractors with the knowledge, experience and willingness to provide energy efficiency products and services to the low-income residential sector. This will help improve the effectiveness of Delivery Agents implementing the program.

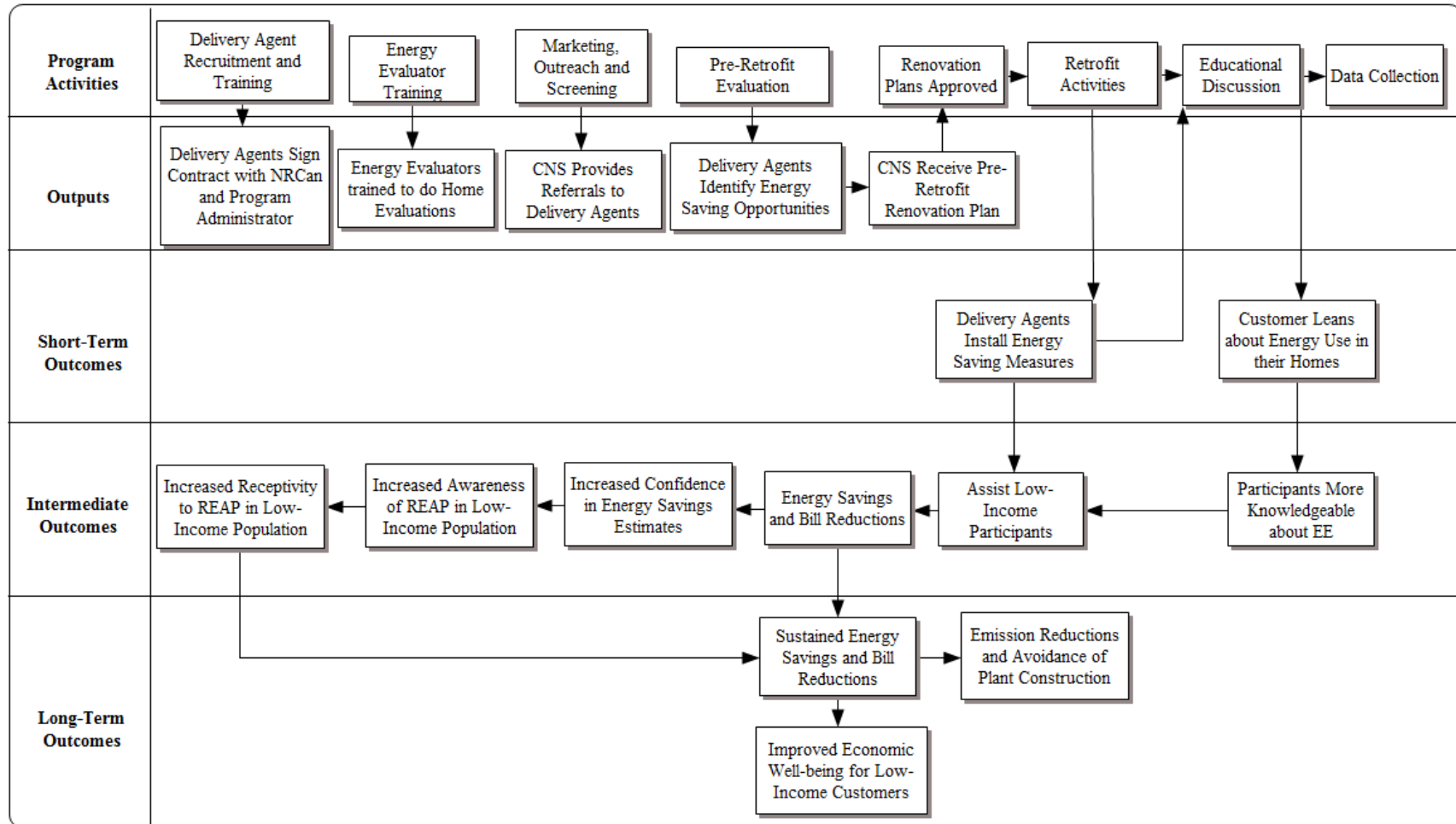
Long-Term Outcomes

- **Sustained energy savings and bill reductions.** Low-income customers experience sustained energy savings and lower energy bills.
- **Improved economic well-being.** Low-income households spend less of their limited income on household energy usage.

- **Emission reductions.** Energy savings translate into a reduction in emissions.
- **Avoidance of plant construction.** Demand and energy savings reduce the need for new generation.

1.1.2 Program Logic

Figure 1-1: Residential Energy Affordability Program Logic Model



2 Impact Evaluation

2.1 Background to the Analysis

For the Low Income Households program, we assessed electric savings through an independent billing analysis of Nova Scotia Power Inc. (NSPI) billing data. Consistent with the Savings Verification Report dated March 2010, we used this approach to provide increased rigor over the impact approach from last year through an analysis of actual energy usage data. The analysis is a time series cross sectional design that used monthly billing data for customers who have participated in the LIH Program as well as a large group of non-participating customers.

It is important to note that we performed this analysis on 2009 participants and used weights to calculate 2010 impacts based on the billing consumption of 2010 participants through September. Before performing the analysis, we confirmed with the LIH program manager that the program had not undergone any significant changes between the 2009 and 2010 program years that might jeopardize the transfer of results. The noted changes in program operations included the use of only three service providers this year as opposed to four last year (one provider was dropped). We also noted that the program had tried to target more electrically-heated homes in 2010, although nearly all 2009 participants had some electric heat and the program manager indicated that the overall proportions of electric versus non-electric homes had not changed between the two program years. Finally, program marketing included radio spots in 2010, which had not been done in 2009. The measure offerings and the savings tracking spreadsheet, however, were the same between the two program years. The program manager also indicated that most participation continued to be from the Southwest portion of the province.

Table 2-1 presents the type of activity within the LIH program participants in 2009 versus 2010. The data in this table provides support for the transferability between the results of the billing analysis of 2009 participants to 2010 participants. In particular, this table shows the numbers of Scope I upgrades (primarily building envelope) versus Scope 2 upgrades (prescriptive type measures such as CFLs, hot water measures wraps, insulation, etc.) in each year, along with activity levels for participants that had both Scope I and Scope II upgrades. While slightly more people had Scope II upgrades in 2010 than 2009, nearly the same proportions in both years had Scope 1 upgrades as well as both Scope I and Scope II upgrades. A total of 645 people participated in the 2010 program year.

Table 2-1: Comparison of 2009 and 2010 Program Activity

Dimension	2009				2010			
	<i>n</i>	Scope I	Scope II	Scope I and II	<i>N</i>	Scope I	Scope II	Scope I and II
Number	386	83	348	45	645	169	548	72
Percent	N/A	22%	90%	12%	N/A	26%	85%	11%

Another interesting comparison to make between the two program years is the amount of electric heat in the participant homes in each year. In 2009, the weighted average percent of electric heat reported by service providers for Scope I participants was 87%; in 2010, it was nearly the same at 89%. This may account for the slightly higher consumption pattern noted among 2010 participants later in this report.

2.2 Research Design & Methodology

The research design chosen for the billing analysis of the LIH program utilized a time-series comparison/cross sectional approach. This research design essentially determines the program impacts by examining the change in participant's usage patterns over time. Comparing a representative control group's change in usage over a similar time period further refines the impact estimate. This experimental design helps to reduce any potential bias in the results.

The time series/cross sectional design achieves internal and external validity. Internal validity means the evaluation is conducted in a manner such that the results isolate the impact of the activity being studied. When other factors are not recognized, the changes attributed to the program may be the result of other phenomena. For example, if the experiment does not recognize the effect of a participant's demographic or end-use characteristics, the change in usage could be explained by the impact of the implementation of the program or, alternatively, by the change in lifestyle of the participant. A research design can help achieve external validity by ensuring that the results are representative of a larger population of interest, allowing for the findings to be generalized. For example, all of the LIH program participants were initially included in the evaluation; however, some of these participants could not be used for technical reasons (e.g., insufficient data). This research design allows the evaluation to represent the total program impacts based on the findings from the participants for whom there was sufficient data.

We used billing data to determine the impact of the program using the maximum available number of program participants and a representative group of non-participants. The participant and nonparticipant billing data used in the analysis extended from January of 2008 through present. This data was analyzed in a systematic way to estimate program impacts. Specifically, the initial analysis determined energy impacts, while minimizing the uncertainty associated with the estimate. The analytic approach included a variety of methods ranging from a simplistic comparison approach to more complex regression techniques. Specifically, the evaluation consisted of the following four steps:

1. Develop participant billing information;
2. Develop a representative control group;
3. Temperature normalize billing information;
4. Quantify the energy impacts.

2.3 Develop Participant Billing Information

Billing analysis requires that sufficient billing information is available to establish consumption trends in both the pre-installation and post-installation periods. This section presents the development of the participant group consumption analysis. For a more detailed discussion of the methodology to develop the participant group, see Appendix A.

For the 2009 participants, Nova Scotia Power provided billing information for 332 participants and program tracking information for 169 LIH program participants. The initial step in developing the participant information was to examine every individual meter reading for each of the participants with billing records. After the individual readings were examined, the participant data was split into pre- and post-installation periods. A large number of the participants did not have participation dates and to avoid omitting these participants from the analysis, the installation was assumed to have occurred during 2009. The next data management step checked the participant accounts to verify that there was enough data in

the pre-participation and post-participation period to be accurately analyzed. At the end of the editing of the participant billing data a total of 210 participants were available for the billing analysis.

2.4 Develop Representative Control Group

The primary goal of the billing analysis was to determine the effects of the LIH program on electricity consumption. One of the challenges in such an analysis is that residential energy consumption can be significantly affected by a range of variables such as changes in weather, activity, demographics, building shell, etc. One of the most efficient methods for controlling these confounding effects is the establishment of a representative “control” group of non-program participants. A control group of 1,860 customers was drawn from an area of comparable temperature/weather, from the same rate class and same heating source as the participants.⁵

Next, the participant group was examined to establish matching criteria. The criteria that were used to partition the participant group into homogeneous groups were based on annualized usage and rate code.⁶ The control group pool of customers was compared to the LIH program participants based on annual usage. Four control group customers were selected for each participant.

Table 2-2 shows the distribution of the annualized usages for the control and participant groups. This table provides evidence of how well the control group selection process worked. Note that the mean and distributed consumptions of the pre-program periods reviewed are very similar. Both groups also appear to have relatively low consumption for residential customers who primarily use electric heat. Based on this comparison, the control group was accepted for the next stages of the analysis.

Table 2-2: Participant & Control Group Comparison of Annualized Usage (kWh)

Statistic	Participants	Control Group
Mean	10,096	10,331
Percentiles		
Maximum	32,749	35,196
90%	21,048	20,789
Third quartile	13,233	14,358
Median	7,629	7,825
First quartile	4,999	5,165
10%	3,679	3,679
Minimum	178	146

⁵ A more detailed description of the methodology used to develop the control group is also included Appendix A.

⁶ Although other matching information such as postal code was not available, the control group was drawn from the areas with the same weather station as the participants.

2.5 Temperature Normalize Billing Information

One of the most important steps in the assessment of the effect of the LIH program is the comparison of the pre-installation to post-installation energy usage. By controlling for other non-program influences, such as weather, the program's effects can be isolated and quantified.⁷ This section presents the results of the temperature normalization procedure.

The temperature normalization procedure for the electric consumption models used heating degree-days based on reference temperatures from 12°C to 21°C and cooling degree-days based on reference temperatures from 18°C to 24°C. The wide range of reference temperatures meant that thousands of models were considered for each customer to determine the optimal models. The temperature data used was from the weather station in Halifax. The daily mean of this station was used for all the participants and control group members. The four-step algorithm to develop the most accurate models was implemented.⁸

Using normal temperatures,⁹ the Normalized Annual Consumption (NAC) was calculated for each period for each group. Table 2-3 shows the NAC for each period. The mean and median consumption is decreased for the participant group from the pre-installation to the post-installation period. The control group shows an increase in the mean and median consumption for the pre to post period. The comparison of the NAC between groups for each period demonstrates that the control group is well matched to the participant group.

Table 2-3: Distribution of Electric NACs (kWh)

	Participants		Control Group	
	Pre-Installation	Post-Installation	Pre-Installation	Post-Installation
Mean	9,693	9,118	10,122	10,771
Median	7,399	6,698	7,887	9,412

2.6 Quantify Energy Impacts

To fully investigate the effects of the program, several different analytical methods were used. These methods ranged from a simplistic comparison approach to a more complex regression technique. While each technique presents its own strengths, the estimates of savings should remain relatively stable from method to method. The more complex methods were expected to produce “better” estimates. This section describes the techniques used to estimate energy savings for the LIH program.

One of the goals of the billing analysis of the 2009 participant data was to use the results in projecting 2010 expected program savings. However, the distribution of 2010 participant pre-program NACs was different than the 2009 distribution of participants NACs. To mitigate the influence of this difference, the participants and the control group were stratified based on the pre-participation NAC. The analysis was performed for each stratum. The results of the analysis could then be projected to the 2010 participants by

⁷ This normalization methodology is described in detail in Appendix A.

⁸ Details of this analysis can be found in Appendix A.

⁹ The normal temperatures used in this analysis are based on the historical daily temperatures.

using the 2010 population weights and pre-participation NACs. The resulting NACs are shown below in Table 2-4.

Table 2-4: Participant and Control Group Pre and Post NACs (kWh)

Stratum	Bounds	Participants		Control Group	
		Pre NAC	Post NAC	Pre NAC	Post NAC
1	<5100 kWh	3,868	3,666	3,949	4,547
2	5101-12,000 kWh	7,813	7,734	7,733	8,823
3	>12,000 kWh	19,133	19,174	19,174	19,213
Total		9,693	9,118	10,122	10,771

The impact evaluation of the 2010 LIH program used the following two methods.¹⁰ First, the energy impact was determined using an Augmented Comparison Method (PRISM). The second approach was a Regression technique.

2.6.1 The Augmented Comparison Approach (PRISM)

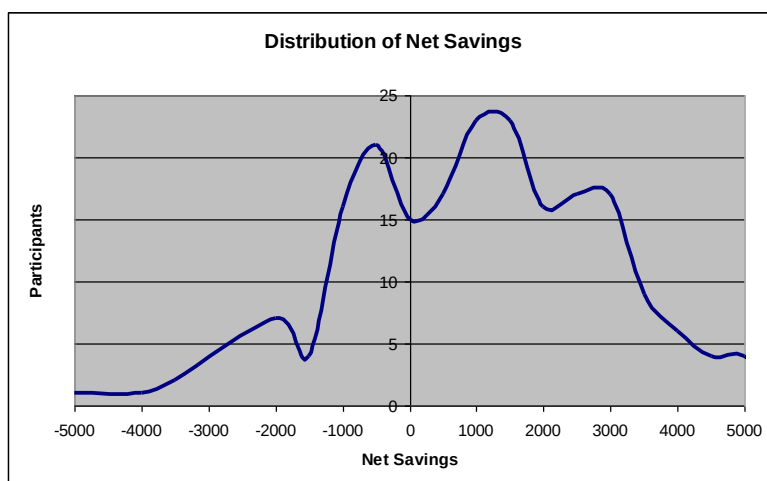
The average control group pre- and post-installation usage along with the participant data were used to estimate net savings. Table 2-5 shows the mean savings for the program derived from this analysis.

Table 2-5: Comparison of 2009 Net Savings (kWh)

Stratum	Bounds	n	Weight	Pre NAC	Gross Savings	Percent Savings (Gross)	Net Savings	Percent Savings (Net)
1	<5100 kWh	52	0.25	3,868	202	5%	792	20%
2	5101-12,000 kWh	105	0.50	7,813	409	5%	1,517	19%
3	>12,000 kWh	53	0.25	19,133	1,269	7%	1,357	7%
Total		210	1.00	9,693	575	6%	1,297	13%

Figure 2-1 shows a comparison of the distribution of the PRISM savings estimates for each participant. This is typical of the distribution of savings generated by PRISM analysis. The distribution is roughly a normal (i.e., bell-shaped) curve, with most of the estimates falling around the center point or mean. The tails of the distribution are symmetrical. The large confidence intervals are revealed by the large spread in values shown in this figure. Although the results can be refined, it is clear from this initial analysis that the LIH program has affected the electric consumption of the participants. In addition, the initial estimates indicate a certain level of energy savings can be associated with the program.

¹⁰ Appendix A provides a detailed discussion of the methodology used to quantify the energy impacts for each of these methods.

Figure 2-1 Distribution of 2009 PRISM Savings

2.6.2 The Regression Approach

To try to obtain a more precise estimate of savings, the regression approach was implemented.¹¹ Only a subset of the participants had tracking system estimates of savings. While a preliminary analysis was performed using this information, a second approach was also applied to incorporate more participants. In this second analysis, based on the assumption that expected savings would be correlated with pre-participation consumption, the value of the expected savings was set equal to the pre-NAC for the participants (and zero for the non-participants). This variable allowed size of participant consumption to be accounted for.

Table 2-6 shows the average savings estimates from the simple model. This table shows that the average customer with tracking information was smaller than the broader participant group; and it produced smaller savings (on a relative and absolute basis) with higher variability. Based on this comparison, it can be assumed that the customers with tracking data were a non representative subset of the broader population. Accordingly, the regression analysis was performed using the Pre-NAC as a highly correlated proxy for the expected savings.

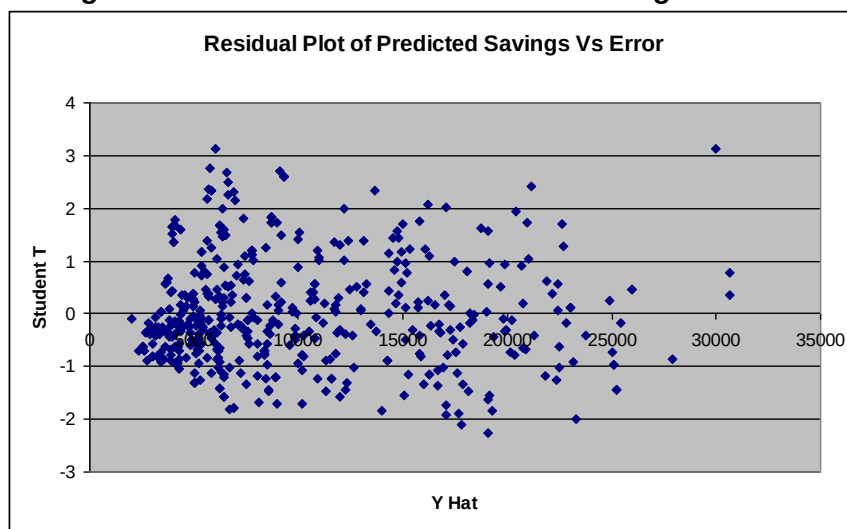
¹¹ A detailed description of the regression analysis is provided in Appendix A.

Table 2-6: Average Savings Estimates from the Simple Model

Using Pre NAC as a Savings Variable Proxy					
Bounds (consumption)	n	Weight	Pre NAC	Net Savings	Percent Savings
<5100 kWh	52	0.25	3,868	614	16%
5101-12,000 kWh	105	0.50	7,813	1,192	15%
>12,000 kWh	53	0.25	19,133	1,232	6%
Total	210	1.00	9,693	1,059	11%
Using Tracking System Estimate of Savings					
<5100 kWh	25	0.25	3,940	494	13%
5101-12,000 kWh	42	0.50	7,421	767	10%
>12,000 kWh	20	0.25	19,265	316	2%
Total	87	1.00	9,548	586	6%

One of the fundamental assumptions of regression is that the standard error of the error terms (or residuals) has a constant variance across the range of predicted values. When the residuals are related to the predicted values, the model is said to be heteroscedastic. Heteroscedasticity is a violation of the basic regression assumptions that could lead to mis-specification of the mathematical relationships. Specifically, as a result of the residual standard error being related to the size of a customer's usage, heteroscedasticity will mis-estimate the confidence interval around the estimates. Heteroscedasticity is common in cross sectional models such as the simple model discussed above.

Figure 2-2 shows the residual plots of the error terms to the pre-installation NAC. In this figure, the residual for each participant and control group member is plotted on the vertical axis and their pre-installation NAC is plotted on the horizontal axis. The resulting chart does not strongly suggest any correlation between the pre-installation NAC and the variance (i.e., the spread) of the residuals, which would be typical of a heteroscedastic relationship.

Figure 2-2 Residual Plot of Predicted Savings vs. Error

When heteroscedasticity is present, the Ordinary Least Squares (OLS) regression approach to establishing the relationship between the dependent variable and the independent variables may be inappropriate. Despite there being little suggestion that heteroscedasticity is present, we felt that performing Weighted Least Squares (WLS) approach would help correct any heteroscedasticity that was influencing the analysis. The initial WLS analysis was performed using the simple model described above. Families of weights based on the standardized geometric mean raised to the gamma power were developed. In order to determine the optimal gamma, the simple model was calculated for each of the weights. The model that minimized the mean squared error was chosen as the optimal model.

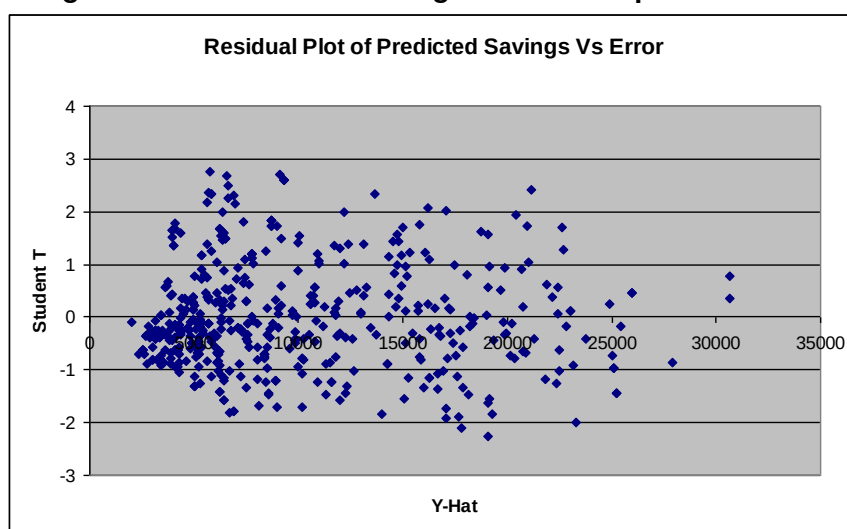
The average savings were estimated based on the WLS regression technique. Table 2-7 shows the average savings estimates from the WLS model. Again, the savings estimates shown in this table were not statistically different from the PRISM results. The average savings per participant were estimated at 1,044 kWh/year, or an 11% reduction from the pre-installation NAC. The 90% confidence interval around the estimate was ± 220 kWh. This was a 21% relative confidence interval.

Table 2-7: 2009 WLS Savings Estimates

Bounds (consumption)	<i>n</i>	Weight	Pre NAC (kWh)	Net Savings (kWh)	Percent Savings (%)
<5100 kWh	52	0.25	3,868	555	14%
5101-12,000 kWh	105	0.50	7,813	1,192	15%
>12,000 kWh	53	0.25	19,133	1,232	6%
Total	210	1.00	9,693	1,044	11%

Figure 2-3 shows the residual plots for the WLS model. These plots show that the WLS approach addressed the heteroscedasticity inherent in the data. Accordingly, it was appropriate to use WLS.

Figure 2-3 Residual Plot-Weighted Least Squares Results



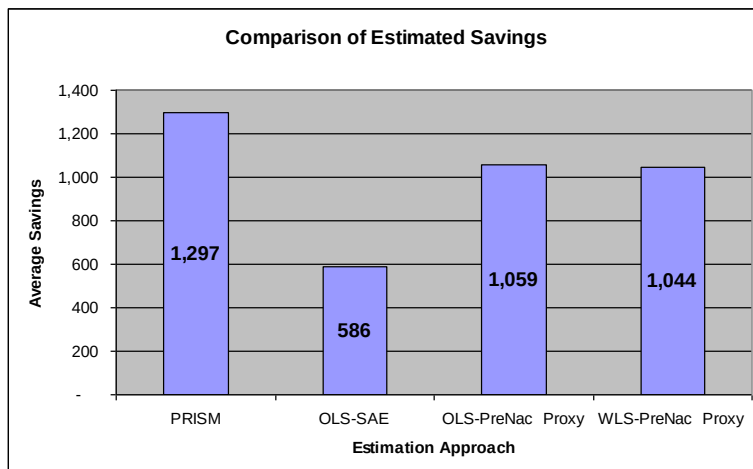
2.6.3 Summary of 2009 Analysis Results

Figure 2-4 shows a comparison of the savings estimates. Among the estimates based on billing analysis alone, the various procedures produced a range of point estimates of savings. However, the differences could not be considered statistically significant. Among these estimates, the choice of the estimate that produced the most accurate estimate of program impact could be analytically determined. This “best” estimate of savings was determined by a review of the process to develop the estimates.

The Augmented Comparison Approach (PRISM) is a solid procedure and produced valid results. The Simple Regression Approach produced valid estimates of savings, but violated some fundamental regression assumptions. The use of tracking system estimates of savings (SAE) unnecessarily restricted the analysis to a subset of participants that were not representative of the population. The WLS regression model, using pre-program NAC as a proxy for the expected savings variable, did not violate the basic regression assumptions, and contained only statistically significant variables. Therefore, the regression results based on this the WLS approach was used to define the most accurate estimate of savings.

Based on the WLS approach, the estimate of savings per participant was 1,044 kWh per year with a 90% confidence interval of 823 kWh per year to 1,265 kWh per year. This was a 21% relative confidence interval.

Figure 2-4 Comparison of Estimated Savings



As discussed earlier, the 2009 results were used to estimate the expected savings from 2010 participants. We acquired the billing data of 2010 participants (through October) with which we normalized their pre-participation usage. These participants were then stratified by using the 2009 strata definitions. As Table 2-8 shows, the average 2010 participant had significantly larger NAC than the average 2009 participant. Applying the stratum level savings, the 2010 average expected savings was 1,117 kWh, (or 9%) with a 90% confidence interval of 854 kWh per year to 1,381 kWh per year. This was a 24% relative confidence interval.

Table 2-8: 2010 Savings Estimates per Participant

Bounds (consumption)	n	Weight	Pre NAC (kWh)	Net Savings (kWh)	Percent Savings (%)
<5100 kWh	44	0.15	3,868	555	14%
5101-12,000 kWh	105	0.35	7,813	1,192	15%
>12,000 kWh	148	0.50	19,133	1,232	6%
Total	297	1.00	12,870	1,117	9%

2.6.4 2010 Program Savings Compared to Other Jurisdictions

To put these results in context, we undertook a limited research effort to compare the performance of the LIH program to similar programs in the northeastern United States. In Table 2-9, we provide five points of comparison to benchmark the savings estimated from this study. Note that these programs may offer different measures and incentives than the LIH program. We provide these results and sources simply as an approximate point of comparison for the results from the current study. This review of savings from other jurisdictions revealed that the 2010 LIH program results were comparable. The EmPower and PPL results are somewhat higher on an absolute savings basis, the PECO results are very similar and the AMP and EVT sources have results that are a lower in average electric savings per participant. In terms of savings as percent of consumption, the LIH program is higher than the PECO study (5.6% and 7.4%) but less than the 2010 CT Low Income study (12.4%), which were the only two studies identified that provided such a benchmark.

Table 2-9: Comparison of Savings to Other Jurisdictions

Program	Evaluation Method	Result (average savings per participating home)
2010 LIH Program	Pre/post treatment/ comparison bill analysis with weather normalization	• 1,117 kWh, 9% of pre consumption
2010 Connecticut WRAP/HELP Study	M&V with DOE modeling with bill calibration	• 1,063 kWh, 12.4% of pre consumption
2009 EmPower New York Program ¹²	Full M&V	• 1,240 kWh net savings
2009 Efficiency Vermont Low Income SF Program ¹³	Unknown. Savings derived from annual report of impacts	• 914.3 kWh
2007 PECO LIURP ¹⁴	Pre/post participant bill analysis with PRISM	• Baseload Program (focus on lighting/appliances) savings: 789 kWh, 7.4% of pre usage • Heating Program (electric heat) savings: 1,190 kWh, 5.6% pre usage
2007 National Grid AMP and Low Income ¹⁵	On-sites with measure verification and HEAT analysis tool	• AMP (electric focus): 968 kWh (Massachusetts), • AMP (electric focus): 827 kWh (Rhode Island)
2006 PPL Electric Winter Relief ¹⁶	Pre/post treatment/ comparison bill analysis with weather normalization	• Baseload Program (no electric heat) net savings: 836 kWh • Full Cost Program (electric heat) net savings: 1,767 kWh

¹² http://www.nyserda.org/pdfs/sbc_annualprogramsevaluation_statusreport_end2009.pdf

¹³ <http://www.efficiencyvermont.com/stella/filelib/FINAL2009AnnualReport.pdf>

¹⁴ <http://www.appriseinc.org/reports/PECO%202007%20LIURP%20Evaluation%20Final%20REPORT.pdf>

¹⁵ <http://neep.org/uploads/EMV%20Forum/EMV%20Library/Low%20Income%20Impact%20Exec%20Summ.pdf>

¹⁶ <http://www.appriseinc.org/reports/Final%20PPL%20WRAP%20Evaluation%20Report.pdf>

Table 2-10 presents the final estimates of savings for the LIH program based upon the billing analysis results described above. This table utilizes the 2010 population of participants (680) and the billing analysis estimate of impacts per 2010 participant of 1,117 kWh from Table 2-8 to estimate a total 2010 program impact at the meter of 800.3 MWh. Note that although this is a net number, given that this is a low income program, the net-to-gross factor is assumed to be near 100%. We therefore consider this estimate to be comparable to a gross savings estimate as well. This result provides a 30% realization rate compared to the program tracking estimate of savings. At the program level, the 2010 installed annual energy savings for the LIH program is determined to be 895.4 MWh at the generator.¹⁷ The NMR team calculated the demand impacts for the LIH program by obtaining the ratio of the program's target peak demand savings to target energy savings from the DSM Targets per the UARB Approved Settlement Agreement. The resulting ratio was then applied to the evaluated energy savings to estimate evaluated peak demand savings of 178 kW at the meter and 199.2 kW at the generator.

Table 2-10: 2010 LIH Program Energy & Demand Savings Summary from Billing Analysis

Total Savings	Tracking Estimate		Evaluated Impact Savings Estimate	
	Meter	Generator	Meter	Generator
Energy (MWh)	2,780.0	3,110.2	800.3	895.4
Demand (kW)	618.4	691.8	178.0	199.2

In considering what might be driving the low realization rate for this program, we looked at ten HOT2000 reports each from the three 2010 program Delivery Agents. In examining these 30 reports, we found an average space heating consumption of 14,660 kWh in 2010. The estimated heating consumption from our billing analysis models was determined to be 3,925 kWh, which is 73% less than that from the HOT2000 reports.

To explore this significant inconsistency further, we reviewed a February 2011 Conserve Nova Scotia report¹⁸ on space heating fuel costs for typical residential dwellings among three specific vintages. This report estimated that, depending on dwelling age, an average dwelling unit of 1,700 square feet with 100% electric heating can be expected to use between 10,113 kWh and 29,966 kWh for space heating (or between \$1,268 and \$3,381 in annual costs). Our phone survey of LIH participants suggested that the average participant used electricity to provide approximately 73% of their space heating needs. So a more appropriate comparison of space heating electric use would decrease the Conserve Nova Scotia estimates by 73% to a range of 7,382 kWh to 21,897 kWh, which still is 2.2 to 5.6 times greater than the use calculated from the billing analysis. Note that the HOT2000 report average we calculated was 14,660 kWh in space heating costs, which is in the center of the Conserve Nova Scotia Range.

There may be plausible explanations for this noted difference, including the possibility that participant spaces in the billing data provided are smaller than 1,700 square feet or that they use far less electricity for heating needs than self reported. However, given this difference, we felt it appropriate to produce an alternative estimate of impacts for the LIH program. In the interest of producing this alternative estimate conservatively, we used the lower bound of the Conserve Nova Scotia space heating use combined with

¹⁷ We used a factor of 1.1188 to calculate the generator savings from the meter savings estimate.

¹⁸ <http://www.conservens.ca/resources/reports/Space-Heat-Survey.pdf>

our estimated 73% electric heat in a supplemental analysis to obtain an estimate of 7,382 kWh. In our billing analysis work, we estimated that among the participants we analyzed, 40.4% of their consumption was used for space heating. This relationship suggests that for a typical dwelling to have 7,382 kWh in electric heat, it would need to have total electric consumption of approximately 18,455 kWh. Utilizing the percent savings from our billing analysis (9%) with this assumption produces an alternative conservative estimate of impact of 1,264 kWh. This result is expanded and provided along with the billing analysis results in Table 2-12. The NMR team calculated the demand impacts for the LIH program by obtaining the ratio of the program's target peak demand savings to target energy savings from the DSM Targets per Program Development Working Group revised targets. The resulting ratio was then applied to the evaluated energy savings to estimate the peak demand savings.

Table 2-11: 2010 LIH Program: Alternative Impact Savings Estimate

	Meter	Generator
Energy (MWh)	1,129	1,264
Demand (kW)	251	281.2

In the final analysis, however, the billing data approach was based on actual consumption data for the low income population and thus may be considered more reliable than extrapolations based on Conserve Nova Scotia's space heating survey report which provided estimates for the general residential population.

As Table 2-12 shows, in 2010, the LIH program's generator-level evaluated energy savings were estimated to be 895 MWh and the evaluated demand savings were estimated to be 199.2 kW.

Table 2-12: 2010 Final LIH Program Energy and Demand Savings

	Meter	Generator
Energy (MWh)	800	895
Demand (kW)	178.0	199.2

3 Process Evaluation

The process evaluation of the 2010 LIH program drew upon in-depth interviews conducted with program staff and contractors as well as surveys of program participants. The program's intent is to facilitate the implementation of cost-effective electrical and fossil fuel energy-saving measures in residential low income customer-owned households. The DSM Administrator's funding is directed to DSM measures that target cost-effective electrical energy savings opportunities.

3.1 Methodology

3.1.1 In-depth Interviews

NMR executives conducted two in-depth interviews in May and October of 2010—one each with the DSM Administrator and the CNS program managers. The NMR team also conducted in-depth interviews with both of the Outreach Agents and with the program administrators at two of the three Delivery Agents in August of 2010. The interviews covered a variety of program-related topics including program design and administration, communication, and delivery.

3.1.2 Participant Survey & Sample Design

NMR completed telephone surveys with a total of 62 participants from the 2010 program year. The participant survey was used to understand the following:

- Overall satisfaction with the program
- Satisfaction with the audit
- Satisfaction with the energy conservation measures installed
- Satisfaction with the effects of the energy conservation measures on their energy bills (this may be limited because of the relatively short elapsed time since installation of the measures)
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Reasons for participating
- Impact of measures on comfort level
- Value of the program to customers
- Barriers to action
- Receptivity to measures included in programs, and other possible measures
- Recommendations for program improvements
- Participant demographics

3.1.3 Sampling Error

In 2010, there were 680 unique participants in LI REAP who received a rebate from the DSM administrator for electric upgrades that were only Scope II upgrades or Scope I and Scope II upgrades. Table 3-1 shows the population, sample size and associated sampling error at the 90% confidence level for the telephone survey.

Table 3-1: Sample Size and Sampling Error

	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
2010 Participants	680	62	±10.0%

3.2 Program Design and Administration

The 2010 Low Income Households (LIH) program operated in concert with the Conserve Nova Scotia Residential Energy Affordability Program (REAP) which had overall administrative responsibility for the program. The program encompasses two types of energy efficient upgrades. Scope I measures primarily include building envelope upgrades. The DSM Administrator funds 100% of Scope I costs if the home is electrically heated. If the home uses both electric and non-electric heating sources, the DSM Administrator funds only that percentage of heating which is estimated to be electricity-based. Scope II upgrades are paid for entirely by the DSM Administrator for all homes regardless of heating source and include measures such as CFLs, electric hot water measures (wraps, insulation, etc.) and replacing eligible freezers and refrigerators with ENERGY STAR models, among other measures. The LIH Program Manual for the 2009-2010 program years (updated in October 2010) describes program operations, including appendices on installation protocols and a technical reference section that includes measure-savings algorithms. Note that the rest of this report will generally reference the LIH program as REAP because this was the name that was used to discuss it in the contractor in-depth interviews and participant survey and, as noted previously, is the name by which it is most familiarly known to program contractors and participants.

The 2010 REAP program utilized three Delivery Agents who implemented the program and acted as the primary point of contact for end users. Each Delivery Agent either subcontracts to or employs certified EnerGuide Energy Advisors who perform the on-site audits and provide EnerGuide ratings for each project. In 2009, the program utilized four Delivery Agents, each one operating in one of the four program regions. The Delivery Agent that left the program was unsuccessful in its bid to remain a REAP delivery agent in 2010.¹⁹

In addition to the reduction in the number of Delivery Agents, there were several other changes to the program between 2009 and 2010. The DSM Administrator recruited a second Outreach Agent to boost program participation by low-income customers who owned electrically heated homes. Another notable program change was an increase in quality control procedures. In the 2010 program year, 40 retrofitted

¹⁹ The CNS program manager was unable to comment on the effectiveness of this new arrangement because, at the time of the in-depth interview, no houses had been completed in the area formerly serviced by the previous Delivery Agent.

homes (10 from each service territory) were inspected by one of two third-party contractors. Other program changes implemented in 2010 included requiring Delivery Agents to supply CNS with photographs of participants' homes prior to installing measures and that participants sign off on the measures installed after the work has been performed. Each of the Delivery Agents interviewed reported that they were already taking photographs of the projects prior to the implementation of the requirement to do so. Therefore, from their perspective, the new photography requirements had not affected the delivery process.

While no new measures had been added to the REAP program, a new protocol for replacing refrigerators and freezers with ENERGY STAR models was put into place. Instead of metering refrigerators and freezers for a period of up to two hours in order to obtain electric consumption data and thereby establish eligibility for replacement, the new protocol required Delivery Agents to determine the age of the appliance based on its serial number and model number. Refrigerators and freezers manufactured before 1990 were eligible for replacement with new ENERGY STAR models. The new protocol for replacing refrigerators and freezers based on the age of the appliance was implemented to address issues that had arisen from metering. For some homes in which the energy evaluation took less than two hours, the appliances were monitored for as little as half an hour, resulting in unreliable electric consumption data on which to determine eligibility for replacement. In addition, on one occasion the freezer has not been plugged back in after metering, causing the food inside the freezer to spoil.

The DSM Administrator created a guidebook for determining the manufacture date of refrigerators and freezers. The guidebook is contained as an appendix within the LIH program manual. If the age of the appliance could not be determined from the guidebook, Delivery Agents were expected to consult web-based resources in order to determine the appliance manufacture date. As a last resort, the LIH program manual instructed Delivery Agents to contact the manufacturer for a manufacture date. Both of the Delivery Agents interviewed went into extensive detail about the problems surrounding the refrigerator and freezer replacement aspect of the program. The program did not initially provide any information on how to identify the age of these pieces of equipment, and this became an extremely cumbersome part of the process. One of the Delivery Agents interviewed stated that his company was not given any information regarding the new refrigerator and freezer replacement protocol during the tender process.

In the in-depth interviews, both the DSM Administrator and CNS program managers mentioned a program design change that is being considered for the future. For some electrically heated homes, the potential energy savings to be achieved by installing building envelope measures are relatively small, which reduces the cost effectiveness of performing Scope I upgrades in those homes. The DSM Administrator and CNS have discussed separating Scope I and Scope II audits as a means of increasing the cost effectiveness of the overall program. If this program design change were implemented, Delivery Agents would visit homes to perform Scope II upgrades only. While performing the Scope II upgrades, Delivery Agents would identify and record the homes with the greatest potential energy savings from Scope I measures. Delivery Agents would then make a second trip to those homes in order to perform the Scope I upgrades. The EnerGuide audit would not be performed for homes receiving only Scope II upgrades. While they had heard about the discussions regarding separating Scope I and Scope II audits, at the time of the in-depth interviews, neither of the Delivery Agents had been part of the discussions. Both of the Delivery Agents seemed to be opposed to the idea. One Delivery Agent observed that it would be too costly to only perform Scope II upgrades. NMR understands that the DSM administrator is taking this into consideration when re-designing the program.

3.3 Program Responsibility and Communication

The Delivery Agents were the implementers for the program; they were responsible for coordinating program activities for all of the REAP projects. Generally, the Energy Advisors conducted the on-site audits, modeled the homes and produced EnerGuide ratings for each project. The REAP program provided about 50% of the business to each of the two Delivery Agents that were interviewed. Both agents stated that there are lulls in business during the year and one indicated that the fluctuations are seasonal. The CNS program manager believed that the program was running more smoothly than last year, particularly because the Delivery Agents had become accustomed to the data requirements of the DSM Administrator.

3.4 Production of Participant Lists

In 2010, the proportion of participants recruited through DCS decreased while the proportion recruited by the Outreach Agents increased. In addition, a third recruitment method was implemented to generate names of prospective participant. CNS worked with SNSMR to identify income-eligible electrically-heated households from the pool of low income applicants to the Heating Assistance Rebate Program. SNSMR collected data on the home heating source, income, and address of applicants to the Heating Assistance Rebate Program. Using this data, CNS was able to identify households eligible for the REAP program. Approximately 300 names were generated in two months through the partnership with SNSMR. In the in-depth interview, the CNS program manager stated that this new recruitment method was “extremely cost-effective and generates a lot of names quickly.”

The DSM Administrator, CNS program manager, and the Delivery Agents interviewed believed that the program delivery process generally ran smoothly. However, the CNS program manager and the Delivery Agents reported one exception—an insufficient number of prospective participant names. Each of the Delivery Agents interviewed said that the biggest problem with the delivery process was that there were not enough names, even with the addition of an Outreach Agent. This resulted in a lack of consistent work for the Delivery Agents and led to inefficiencies in the delivery process. In addition, one of the Delivery Agents believed that the amount of homes that were not properly screened had increased since 2009 and that there should be a more detailed screening process. In the in-depth interview, this Delivery Agent stated, “I drive 100 miles to a home and there is absolutely nothing to do,” and, “A lot of it is the outreach agents don’t know exactly what we’re looking for.” The lack of regularity in the provision of prospective participant names was identified as a significant weakness of the 2009 REAP program year. The 2010 in-depth interviews exposed this to be an ongoing issue and revealed that improper screening of participant homes may be an additional program weakness.

3.5 Role of the Outreach Agents

The Outreach Agents were responsible for recruiting eligible low-income homeowners who heated their homes primarily with electricity. The service territory was divided between the two Outreach Agents. One Outreach Agent recruited participants in southwest and central Nova Scotia while the other Outreach Agent recruited participants in the northern part of the province. The Outreach Agents were responsible for advertising the program, recruiting participants and helping them with the application process. The participants recruited by the Outreach Agents supplemented those who were recruited from the DCS and SNSMR lists. The DSM Administrator set goals for the number of participants recruited into the program. At the time that the in-depth interviews were conducted, the Outreach Agents reported falling short of their goals.

The Outreach Agents marketed the program through the use of flyers, leaflets and other 'leave behind' marketing materials. The Outreach Agents distributed these materials throughout the province with the assistance of government and community organizations. These included municipal governments, retail stores, churches and community organizations such as food banks, women's centers, family resource centers, senior's clubs and legal aid organizations. One of the Outreach Agents distributed program leaflets to a few financial institutions on cheque week when some low income individuals go to pick up their cheques. Both of the Outreach Agents identified the Good Neighbour Energy Fund, a heating assistance program run by the Salvation Army in partnership with Nova Scotia Power, as a particularly successful source of applicants. Two new recruitment methods were used to advertise the program in 2010: a radio ad was run in some of the local radio stations, and classified ads were placed in circulars distributed to households in rural areas. Both of the Outreach Agents believed that incorporating an advertising budget into the program would allow them to recruit more participants. The three eligibility requirements for REAP were that applicants owned their homes, that the homes were electrically heated, and that applicants were income eligible according to the Low Income Cut-Offs (LICO) used by Statistics Canada. The LICO for rural areas is lower than that for urban areas. Currently, applicants whose incomes are no more than one thousand dollars greater than the LICO threshold are considered income eligible for the program. One of the Outreach Agents reported that applicants who were rejected as income ineligible typically have incomes of three to six thousand dollars greater than the LICO threshold. Both of the Outreach Agents believed that they could recruit a significantly greater number of participants if the income eligibility threshold were increased, particularly the threshold for rural areas.

Outreach Agents were new to the REAP delivery process and the in-depth interviews with the Outreach Agents revealed significant communication gaps. The communication lines stayed open between the Outreach Agent and the participants they recruited, but was not established between the participants and CNS until the participant entered into the program. Both of the Outreach Agents reported instances in which they had passed along suggestions, concerns, or customer complaints to the DSM Administrator and CNS program managers but had received no resolution regarding the issues. Participants who applied to the program through the Outreach Agents were sent a letter informing them that they would receive a welcome letter from CNS in several weeks. However, the Outreach Agents reported process delays of five to six months. The program design identifies the Outreach Agent as a source of program participants and therefore they have no influence over when the work was done, creating a communication gap between the time that Outreach Agents signed people up for the program and the time upgrades were initiated. The Outreach Agents were not regularly updated with information regarding delays in the application process or the status of individual complaints. Since the time of the interviews, the DSM

Administrator has discussed these gaps with the Outreach Agents and regular check-ins have been put into place. Thus the Program Administrator has addressed these issues.

3.6 Customer Expectations

The in-depth interviews uncovered inconsistencies in customer expectations regarding the program. The CNS program manager received reports from Delivery Agents that the expectations of participants recruited by the Outreach Agents were higher than those recruited through the other channels. Specifically, homeowners recruited through the outreach channel more often lacked understanding of the audit process and believed with certainty that the program would provide them with a new refrigerator, freezer, and/or a certain amount of insulation. On the other hand, one of the Outreach Agents received phone calls from some participants complaining that the Delivery Agents had led the participants to believe that they would be receiving a new appliance when in fact they were not. This Outreach Agent has also received customer complaints regarding abbreviated home energy audits in which the Delivery Agents briefly inspected newer homes with lower potential for energy savings as opposed to conducting a full audit. These customers were expecting full energy audits and corresponding upgrades. The Outreach Agent believed that the Delivery Agents were not clearly explaining the purpose of the abbreviated audit, and commented, “The person just thinks that they haven’t been given the program.”

3.7 Program Tracking and Reporting

The REAP program collects data from customers regarding their energy usage before and after participation in the program. This is done by asking the homeowners to sign a waiver that allows CNS and the DSM Administrator to access energy use information from their fuel providers and from NSPI. Subsequent to their participation, energy use from one year before the upgrades can then be compared to energy use for at least one year after the upgrades.

In addition, the program maintains a record of the EnerGuide evaluations performed. These reports, along with the renovation proposals, provide energy savings estimates for the measures that are implemented through the program.

Delivery Agents keep a database of every home they assess. All Delivery Agents submit a monthly tracking sheet to CNS. The Delivery Agents interviewed indicated that tracking and reporting data had increased and it had been provided more frequently compared to last year. One of the agents would have liked to receive feedback from CNS and the DSM Administrator, particularly on how different regions and companies fared within the program. As observed in the 2009 evaluation, CNS staff maintained an EXCEL spreadsheet which served as a project management tool used by both CNS staff and contractors working on the program. The spreadsheet included customer contact information, EnerGuide pre- and post-upgrade scores, the change in rating, the estimated modeled change, and greenhouse gas reductions. It did not, however, include any detail on the measures that were implemented at each house. This information is currently kept in hard copy for each participant and is planned for inclusion in the tracking spreadsheet at a later, unspecified point in time. Delivery Agents submitted an invoice along with receipts at the end of each month to CNS. It is important to note that at no point during the data tracking process was a single unique identifier assigned to program participants. Instead, program records were maintained based on customer names. In the 2009 evaluation, NMR also observed that customer names were inadequate as unique participant identifiers as they were prone to typos or misspellings, were not unique

and may have changed over time as participants proceeded through the program. CNS continued to use these data tracking procedures for the 2010 program.

3.8 On-Site Visits

NMR conducted two onsite visits, accompanying Energy Advisors to a “D” audit and an “E” audit. Both onsite visits revealed that contractor services were comprehensive and performed very professionally. In the “D” audit, the Energy Advisor performed a comprehensive audit of the home and provided an excellent overview presentation of the program and potential energy savings, giving the customer a clear and complete explanation of what to expect from the evaluation and a general timeline for completion of the work. In the “E” audit, the Energy Advisor gave the customer a clear and complete explanation of all of the energy efficiency upgrades that were done in the home. He did a blower door test and thoroughly inspected all of the work that had been done. The customer had not yet seen any difference in their energy bills because the work had been done over the summer. The one exception was that as a result of the new water heater wrap and insulation, she was now getting hot water immediately. The customer was very happy with the work.

4 Survey of Participants

4.1 Screening and Eligibility

Participant eligibility for the participant survey focused on DSM electrical measures provided by the Delivery Agents. Survey respondents were screened to include only those participants who primarily heat their water (100%) or their home (73%) with electricity. (Table 4-1)

Table 4-1: Heating with Electricity

Hot Water	2009	2010
<i>Sample size</i>	55	62
Yes	96%	100%
No	4	--
Space Heat	2009	2010
<i>Sample size</i>	55	62
Yes	35%	73%
No	65	27

4.2 Awareness, Motivations and Barriers

As Table 4-2 shows, two out of five respondents to the survey (40%) reported first learning about REAP from outreach activities: a letter (19%), a direct telephone contact (15%), or an agency contact (6%). About one in seven respondents had learned about the program through word of mouth (13%). Almost one out of four respondents could not recall how they first learned about the program in (24%). Notably, significantly fewer respondents reported first learning about the program from an agency contact in 2010 (6%) than they did in 2009 (33%). This is probably a reflection of the increased diversification of 2010 sources of prospective program participants beyond the DCS list to include more outreach agents and SNSMR.

Table 4-2: First Contact
(multiple response)

Source	2009	2010
<i>Sample size</i>	55	62
I received a letter about the program	15%	19%
Someone called me about the program	11%	15%
My neighbor, friend, co-worker, or family	15%	13%
Internet/online	4%	8%
Agency Contact	33%	6% ^β
While applying for fuel assistance	--	6% ^β
Newspaper	9%	5%
Advertisement	2%	3%
Other	5%	-- ^β
Don't know	13%	24%

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Both the Delivery Agents and Outreach Agents reported that customer awareness regarding REAP was low. Customer awareness was generally greatest in the southwest region of the province. To illustrate the low level of awareness, one of the Outreach Agent recounted a presentation she had given to a council regarding the program. The council members seemed as if they had not heard about of the program before and expressed enthusiasm for the program during the presentation. As the Outreach Agent exited the meeting, she noticed that a poster promoting REAP was already displayed on the council's bulletin board. From the Outreach Agent's perspective, this is one of numerous examples in which the program does not "stick in people's minds."

In the in-depth interviews, the Outreach Agents identified several likely causes for low customer awareness. The significant delays in program delivery had negatively impacted the number of completed projects, therefore decreasing the likelihood of awareness generated by word-of-mouth from completed households. Moreover, the delays and communication gap themselves were unlikely to inspire word-of-mouth promotion by program applicants. Additionally, the program was not consistently referred to by the same name throughout the program delivery process. Outreach Agents referred to the program as the Nova Scotia Low Income Households program when they recruited participants. However, the welcome letter that CNS sent participants referred to the program as REAP. One of the Outreach Agents reported that on more than one occasion, customers had contacted her to follow up on the status of their applications, when in fact they had been sent welcome letters from CNS but had failed to recognize them as the program to which they had applied. This agent suggested customizing the letter to reflect recruitment channel in order to enhance participant recall of the program. The Outreach Agents reported confusion among individuals between the REAP program and EnerGuide Existing Homes program for which federal rebates had been cancelled. One Outreach Agent reported fielding inquiries regarding the EnerGuide Existing Homes program, and the other reported following up with an individual who had neglected to submit the REAP application upon learning of the cancelation of the federal rebates under the EnerGuide Existing Homes program, and mistaking it for REAP.

When asked their reasons for participating in the REAP program, the majority of respondents reported a general savings benefit as their primary motivation. As Table 4-3 shows, 48% reported saving money on their electric bills, 8% reported that the program was provided free of charge, and 6% reported saving energy. When asked if there were any other reasons for participating in the program, about one out of five respondents again reported saving money on their electric bills. These responses were supported by the Outreach Agents who said that the primary motivations for participation in REAP were to save money and to improve comfort.

More than twice as many 2010 respondents (48%) as 2009 respondents (18%) cited wanting to save money on their electric bills as the most important motivation for participating in REAP. By contrast, one-fourth as many 2010 respondents (6%) as 2009 respondents (24%) cited no cost for services as the most important participation motivation. These differences in motivations may reflect the sources for the participants in each year. As noted previously, in 2009, the participants came primarily from DCS, whereas in 2010 the participants came from the Outreach Agents and SMSNR.

Table 4-3: Reasons for Participating

	2009		2010	
	Most Important Motivation	Other Reasons for Participating (multiple response)	Most Important Motivation	Other Reasons for Participating (multiple response)
<i>Sample size</i>	55	52	62	56
To save money on my electric bill	18%	29%	48% ^β	21%
No cost for services	24	2%	8 ^β	2%
Comfort	15	12%	8	9%
To receive insulation	15	4%	8	--
To save energy	16	17%	6 ^β	11%
Overall good idea/needed it	2	2%	5	2%
To know home's energy efficiency level	--	--	3	--
To receive a new refrigerator	--	2%	--	2%
To receive free CFLs	2	--	--	--
To help the environment	--	4%	--	4%
Older home	2	--	--	--
To improve resale value	--	--	--	2%
Other	2	4%	3	2%
Don't know	5	35%	10	52% ^β
Refused	--	4%	--	5%

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Respondents were asked if, prior to participation, they had had any concerns about taking part in the program. Only four 2010 respondents reported concerns about participating. Two respondents were concerned that they might have to pay for something even though the services were being provided and measures installed free of charge, one respondent did not believe the program was free of charge, and one respondent was concerned that the contractors would make a mess while performing the upgrades. (Table 4-4)

Table 4-4: Participation Concerns
(number of respondents)

	2009	2010
<i>Sample size</i>	55	62
Had concerns about participation	13%	6%
<i>Sample size</i>	7	4
That I'd have to pay something	1	2
Didn't believe it was really free	4	1
That they would make a mess	--	1
That I wouldn't be eligible	1	--
Don't know	1	--

The other Outreach Agent believed that the income thresholds were unreasonably low and constituted a major barrier to program participation. Furthermore, the agent commented that interpreting the LICO chart, which indicates eligibility based on urban or rural inhabitance, was difficult for some participants and could potentially represent a barrier to participation. However, outreach agents focus on explaining the chart to potential participants.

4.3 Verification of Measures Installed

Survey respondents were asked to verify that the measures recorded in the program tracking spreadsheets for their homes had been installed in their homes by the Delivery Agents. Of the measures that were recorded to have been installed, the majority were verified by the survey respondents to actually have been installed. Respondent verification of a couple of measures increased from 2009 to 2010. For example, verification of tank wraps for electric hot water heaters increased from seven out of ten respondents (70%) in 2009 to about nine out of ten respondents (91%) in 2010. Additionally, respondent verification of power bars increased from around three out of five respondents (64%) in 2009 to over nine out of ten respondents (93%) in 2010. However, several measures had lower verification rates in 2010. Approximately three out of four respondents could verify installations of building envelope measures (77%), representing a statistically significant decrease in respondent verification from 2009. Additionally, in both 2009 and 2010, around three out of five respondents could verify installations of low flow kitchen faucet installations (Table 4-5). These low levels of verification might have been because respondents had had difficulty recalling the measures installed, possibly due to the passage of time between measure installation and the survey. As Table 4-7 shows, while two out of five respondents (40%) had the REAP program measures installed from one to six months ago, a larger proportion of respondents (45%) reported that the measures had been installed more than seven months ago. Nevertheless, it is also

possible that at least some of these responses could be because the Delivery Agents did not actually install all of the measures recorded in the program tracking records.

Table 4-5: Verification of Measures Installed

Measures	2009				2010			
	Sample size	Yes	No	DK/ Ref	Sample size	Yes	No	DK/ Ref
Building envelope measures	37	95%	5	--	39	77% ^β	23	--
Programmable thermostats	14	93%	7	--	24	100%	--	--
Tank wrap for electric hot water heater	40	70%	30	--	22	91% ^β	9	--
Pipe wrap for exposed hot water pipes	24	71%	25	4	20	75%	20	5
Low flow showerheads	26	73%	27	--	14	71%	29	--
Low flow kitchen faucet aerators	27	59%	41	--	12	58%	33	8
Incandescent lamp replacement with CFLs	52	98%	2	--	30	93%	3	3
Halogen torchiere replacement with CFL torchiere	1	100%	--	--	--	--	--	--
Replacement of broken or un-covered outdoor porch light fixtures to accommodate CFLs	3	33%	67	--	3	100% ^β	--	--
Primary refrigerator and stand-alone freezer replacement	6	100%	--	--	5	100%	--	--
Second refrigerator and freezer removal	3	100%	--	--	2	50%	50	--
Electric kettle with auto shut-off	26	77%	23	--	11	82%	18	--
Power bars to facilitate reduction in standby electricity loss	33	64%	36	--	15	93% ^β	7	--
Replacement of ceiling (flush mount) fixtures with CFL compatible fixtures	--	--	--	--	1	100%	--	--
Dehumidifier replacement or removal	12	100%	--	--	11	91%	9	--
Other products	55	27%	73	--	62	19%	79	2

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Nearly one out of five respondents also mentioned several measures provided to them through the program that were not on the DSM Administrator tracking database. Among them, one out of three respondents (33%) reported receiving a fan or child safety plugs for outlets. (Table 4-6) Note that the program measures did not include televisions or lamps and those responses therefore reflect respondent confusion or misunderstanding.

Table 4-6: Other Measures provided through Program
(multiple response)

Other Measures	2009	2010
<i>Sample size</i>	15	12
Fan (bathroom, ceiling, or house)	33%	33%
Plugs	33%	33%
Toilet measures	40%	17%
Carbon monoxide detectors	7%	8%
Television	--	8%
Lamp	--	8%
Dryer vent	7%	--

4.4 Experience with installed measures

As noted previously, two out of five respondents (40%) had energy savings measures installed from one to six months ago. More than two out of five respondents (45%) reported that the REAP program measures had been installed seven or more months ago. (Table 4-7)

Table 4-7: Length of Time since REAP Program Installed Measures

	2009	2010
<i>Sample size</i>	55	62
Less than one month	2%	5%
One to six months	62	40 ^β
Seven months to a year	27	27
More than one year	9	18
Don't know	--	10 ^β

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Respondents were asked a series of questions to gauge their perception of the value of the REAP upgrades to participants. Respondents were asked to rate how each of the following had changed since participating in REAP: comfort of the house, value of the house, reduction in energy bills, their interest in energy efficiency, and their knowledge of energy efficiency. Respondents were asked to give their response on a scale of one to five, where one meant 'no improvement' and five meant 'considerable improvement.' As Table 4-8 shows, at least three out of five 2010 respondents reported improvement in their comfort level (61%) and their interest in energy efficiency (61%). At least two out of five respondents reported improvement in their knowledge of energy efficiency (46%) and their reduction in

energy bills (41%). In contrast, relatively fewer respondents reported improvement in the value of their homes (29%).

Compared to 2009, significantly fewer 2010 respondents reported improvement in the comfort of their house (75% in 2009 vs. 61% in 2010), their energy efficiency knowledge (70% in 2009 vs. 46% in 2010), and the value of their house (55% in 2009 vs. 29% in 2010).

Table 4-8: Measures that Resulted in Improvement
(Rating of 4 or 5 where, 5= 'considerable improvement' and 1 = 'no improvement')

	2009	2010
<i>Sample size</i>	55	62
Comfort of the house	75%	61% ^β
Value of the house	55%	29% ^β
Reduction in energy bills	52%	41%
Your energy efficiency interest	73%	61%
Your energy efficiency knowledge	70%	46% ^β

^β Significantly different from 2009 LI REAP sample at the 90% confidence level

When asked about the impact of the measures installed through REAP on their comfort levels, about four out of five 2010 respondents reported positive impacts associated with room temperature—80% said noticeably fewer drafts and 79% said that the program provided even temperatures throughout the home. Additionally, two out of three (66%) reported that the measures made it more convenient to control temperature automatically, although this was significantly fewer than those reporting it in 2009 (84%). Around one-half of the respondents also said that participation had provided improved indoor and outdoor lighting (54%) and longer lasting hot water (52%). (Table 4-9) The relatively high percentage mentions for some of the specific aspects of comfort levels (Table 4-9) as compared to the overall rating for the comfort of the house (Table 4-8) suggests that, when made to think about it, respondents may have more fully realized the impacts that the measures had on the comfort of the house.

Table 4-9: Specific Impacts on Comfort
(Multiple response)

	2009	2010
<i>Sample size</i>	55	62
Noticeably fewer drafts throughout home	85%	80%
Provided even temperatures throughout the home	80%	79%
Made it more convenient to control temperature automatically	84%	66% ^β
Improved indoor and outdoor lighting	46%	54%
Provided longer lasting hot water	53%	52%
Reduced the noise level of replaced appliances	35%	28%
Other	2%	--
Don't Know	6%	7%

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Respondents were asked to report what changes, if any, they noticed in their energy bills since the measures were installed. Two out of five respondents (40%) reported a decrease in their energy bills, around one out of five reported an increase in their energy bills (21%), and more than one out of four respondents reported no change in their energy bills (27%). Of the twenty-five respondents who reported a decrease in their bill, ten mentioned an average monthly savings of \$42. Significantly fewer 2010 respondents (40%) than 2009 respondents (60%) reported that their bills had gone down. (Table 4-10)²⁰

Table 4-10: Changes and Savings to Energy Bill

Effect on energy bill	2009		2010	
<i>Sample size</i>	55		62	
Bills have gone down	60%		40% ^β	
Bills have gone up	6		21 ^β	
No change in the bills	20		27	
Don't know	15		11	
Savings	2009		2010	
	<i>Sample size</i>	Mean	<i>Sample size</i>	Mean
% saved per month	6	25%	--	--
% saved per year	1	40%	1	5%
Dollars saved per month	15	\$34	10	\$42
Don't know/refused	11	--	14	--

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

When asked how satisfied they were with the savings from the program measures, almost three out of four respondents (72%) were satisfied and over one-third (35%) said they were very satisfied. It is important to note that over one in ten respondents were unable to provide a rating of their level of satisfaction. (Table 4-11)

Table 4-11: Satisfaction with Savings from Program Measures

(Rating: 5= 'very satisfied' and 1 = 'not at all satisfied')

	<i>n</i>	5	4	3	2	1	DK
2009	55	47%	33	4	2	4	11
2010	62	35%	37	8	3	2	15

²⁰ Note that reported increases in energy bills may also have been driven by an increase in 2010 in the prices for most fuel sources.

4.5 Behavior change

Since receiving information from the energy audit component of REAP, three out of five respondents (60%) reported that their behavior had changed with regard to how they used energy at home. (Table 4-12)

Table 4-12: Behavior Change since Audit

	2009	2010
<i>Sample size</i>	55	62
Yes	66%	60%
No	29	35
DK/Refused	5	5

More than one-half of the respondents (51%) now turn off lights when they may not have before. Additionally, over one in five (22%) now set their heating thermostats lower and turn off appliances. (Table 4-13)

Table 4-13: Specific Behavior Change

(multiple response)

	2009 Respondents	2010 Respondents
<i>Sample size</i>	36	37
I turn off my lights now	50%	51%
I set my heating thermostat lower	28%	22%
Turn off appliances	17 %	22%
Changed lighting	6 %	11%
I use less hot water to wash my clothes	6%	8%
I set my water heater thermostat lower	6%	5%
Close doors and windows	6%	3%
Use less fuel	6%	--
Other	8%	3%
Don't know	8 %	16%

When asked if there were any other energy savings actions taken on their own, in addition to the measures installed by the program, more than two-thirds of the 2010 respondents (69%) reported taking no additional actions. Among those who reported additional energy savings actions, envelope measures such as weather stripping and the replacement of doors and windows were reported most frequently (11% each). (Table 4-14)

Table 4-14: Additional Actions Taken Outside of the Program

(Multiple response)

Additional Actions	2009 Respondents	2010 Respondents
<i>Sample size</i>	55	62
Air sealing / (weather stripping)	16%	11%
Doors and windows replaced	16%	11%
Building envelope insulation	9%	6%
Roofing	4%	2%
Heating system	4%	2%
Water heating & usage	4%	2%
Dehumidifier replacement	--	2%
Power bars	4%	--
Appliances (energy efficient)	2%	--
CFL lighting	2%	--
Other	4%	6%
No other actions reported	55%	69%

4.6 Satisfaction and Value

The survey respondents were asked several questions regarding their satisfaction with specific aspects of REAP. Overall satisfaction with the program was high. Nine out of ten respondents (90%) were satisfied with the program overall and at least eight out of ten respondents were satisfied with each specific aspect of the program. (Table 4-15)

Only two respondents indicated that they were dissatisfied with the program overall. When asked to explain why they were dissatisfied, one of the respondents expected more from the program and the other respondent stated that the Delivery Agents had changed something they should not have. Additionally, there were two respondents who were dissatisfied with the energy evaluation. One of those two respondents reported expecting more as the primary reason for the dissatisfaction, while the other indicated that the Delivery Agent had “fudged the energy savings number.” While respondent satisfaction remained high in 2010, satisfaction with most aspects of the program declined slightly from 2009. In particular, the decrease in satisfaction with the energy conservation measures installed, the energy efficiency presentation, and the quality of the work completed was statistically significant at the 90% confidence interval.

Table 4-15: Satisfaction with LI REAP
(Percentage very satisfied/satisfied)

Very Satisfied/Satisfied	2009	2010
<i>Sample size</i>	55	62
Program overall	94%	90%
Courteousness of energy evaluator	95%	93%
Overall communication from the REAP program	--	93%
Energy evaluation	92%	89%
Energy evaluator	93%	87%
REAP contractor/worker	93%	84%
Energy evaluation report with recommendations	89%	84%
Energy efficiency presentation	95%	84% ^β
Energy conservation measures installed	93%	81% ^β
Time required to complete work	--	81%
Quality of the work completed	95%	81% ^β
Scheduling of work	93%	--

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

In addition to high levels of satisfaction, almost four out of five respondents (79%) reported that the program had provided them with substantial value and nearly three out of five respondents (58%) reported that the program had provided them with ‘immense value.’ Not surprisingly, based on the high levels of satisfaction and value reported by respondents, nearly all of the respondents (97%) also reported that they would recommend the program to a friend or family member; more than four out of five respondents (83%) reported that they had actually recommended the program to a family member or friend already. (Table 4-16)

Only two respondents stated that they would not recommend the REAP program to a family member or friend. When asked why they would not recommend the program, one respondent indicated that it did not make sense to recommend the program to someone “unless they had a property that had problems because they couldn’t do anything.” The other respondent expressed disappointment with the eligibility requirements and with the service provided by the Delivery Agent, commenting, “I can’t get them to do anything here. They say it is a mini home and therefore it does not qualify,” and, “They made promises to fix the hole and they didn’t. They pulled the freezer out and didn’t put it back. I expected better service.”

Table 4-16: Value of the program

	2009						2010					
	<i>n</i>	Rating: 5= ‘immense value’ and 1 = ‘little value’					<i>n</i>	Rating: 5= ‘immense value’ and 1 = ‘little value’				
		5	4	3	2	1		5	4	3	2	1
<i>Overall value</i>	55	58%	27	13	2	--	62	58%	21	16	3	2
Would recommend the program to a family member or friend												
<i>Sample size</i>	55						62					
Yes	96%						97%					
No	2						3					
Don’t know	2						--					
Have recommended the program to a family member or friend												
<i>Sample size</i>	--						60					
Yes	--						83%					
No	--						15					
Don’t know	--						2					

Nine respondents (15%) stated that they had not recommended the program to a family member or friend. When asked to explain why they had not recommended the program to anyone, the majority of those nine respondents provided a reason related to the program's eligibility requirements. (Table 4-17)

Table 4-17: Reasons for Not Recommending REAP

(number of respondents)

Reason	2010
<i>Sample size</i>	9
Do not believe friends/family are income eligible	3
Friends/family rent their home	2
Other	4

4.7 Barriers to Action and Recommendations for Improvement

Respondents were asked if there were any energy efficiency measures recommended by the REAP program that they had chosen to not install in their homes. Approximately one out of ten respondents (11%) reported not installing measures that had been recommended to them. The types of measures that participants had chosen not to install and their reasons for not installing them varied. (Table 4-18)

Table 4-18: Chose not to Install Recommended Measures

	2009	2010
<i>Sample size</i>	55	62
Yes	4%	11%
No	96	87 ^B
Don't know/Refused	--	2
Measures not installed	Number of Respondents (multiple response)	Number of Respondents (multiple response)
<i>Sample size</i>	2	7
Incandescent lamp replacement with CFLs	--	2
Building envelope measures	2	1
Programmable thermostats	--	1
Low flow showerheads	--	1
Low flow faucet aerators	--	1
Electric kettle with auto shut-off	--	1
Don't know/Refused	--	1
Reason	Number of Respondents (multiple response)	Number of Respondents (multiple response)
<i>Sample size</i>	2	6
Did not believe any changes will result in lower energy bills	--	2
Hassle factor, too much disruption to my daily routine	--	1
They would scuff the paint	--	1
Other	2	3

^B Significantly different from 2009 LI REAP sample at the 90% confidence level.

Respondents were asked to provide any recommendations for improving the program. Three out of four respondents (76%) did not offer any recommendations. The most commonly mentioned specific recommendation pertained to improving the quality of work performed by the Delivery Agents. (Table 4-19)

Table 4-19: Recommendations to improve program

	2009	2010
<i>Sample size</i>	55	62
Improve quality of work	--	5 ^β
Complete work faster	--	3
Improve communication	--	3
Increase awareness through advertisement	2	2
Include basement insulation	2	2
Use dust-proof insulation	--	2
More thorough audit	7	-- ^β
Include doors and windows	7	-- ^β
Increase availability threshold	4	--
More employees to perform services	4	--
Include showers	2	--
Perform maintenance on leaks	2	--
Other	6	8
None	66%	76%

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Both of the Delivery Agents interviewed did some outreach for the program. One agent would like to see the program increase its advertising in avenues such as local newspapers in order to enhance customer awareness. The other agent would like to see an increase in the scope of the program to allow contractors to address health and safety issues in the home.

When queried if there were additional energy savings measures that had not been covered by the program that participants would like to have seen, over one-half of the respondents (55%) reported interest in additional measures. Among those who mentioned a measure, approximately three out of four (74%) expressed an interest in additional building envelope measures such as additional insulation, windows, doors, or roofs. (Table 4-20)

Table 4-20: Interest in measures not provided by program

Interest	2009	2010
<i>Sample size</i>	55	62
Yes	40%	55% ^β
No	56	42
Don't know	4	3
Specific Measures	2009 (multiple response)	2010 (multiple response)
<i>Sample size</i>	22	34
Additional windows/envelope	50%	59%
Doors	36%	12% ^β
Refrigerator/freezer	18%	12%
Dehumidifier	--	9% ^β
Fans	--	9% ^β
Washing machine	5%	6%
Water heater	--	6%
Dishwasher	5%	3%
Dryer	5%	3%
Roof	--	3%
Ventilation	9%	--
Lighting	5%	--
Programmable Thermostat	5%	--
Stove Furnace	5%	--
Other	5%	9%

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

4.8 Demographics

Almost seven out of ten respondents (69%) lived in detached single family homes and fewer than one in five respondents lived in mobile homes or trailers (15%). The majority of homes (76%) had two or three bedrooms. All of the respondents currently owned or were buying their residences. More than one-half of respondents (56%) reported only themselves as the sole full-time resident of the household and about one out of four respondents (27%) reported two full-time inhabitants. (Table 4-21)

Table 4-21: Residence

Type of home	2009	2010
<i>Sample size</i>	55	62
Detached single-family home	82%	69% ^β
Mobile home or house trailer	16	15
Apartment building that has fewer than five stories	--	6 ^β
Townhouse or duplex which share adjacent walls	2	2
Semi-detached house	--	2
Other	--	6 ^β
Ownership	2009	2010
<i>Sample size</i>	55	62
Own/buying	100%	100%
Rent/lease	--	--
Number of bedrooms	2009	2010
<i>Sample size</i>	55	62
1	4%	10%
2	36	34
3	49	42
4	7	8
5	4	3
6	--	2
Don't know/refused	--	2
Full time inhabitants	2009	2010
<i>Sample size</i>	55	62
1	56%	56%
2	33	27
3	6	6
4	2	5
5	4	--
6	--	3
8	--	2

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

The majority of respondents (84%) were aged forty-five or older and almost one-third were aged sixty-five or older (32%). Nearly seven out of ten respondents were female (69%). (Table 4-22)

Table 4-22: Age and gender

Age	2009	2010
<i>Sample size</i>	55	62
18 to 24	2%	0%
25 to 34	4	3
35 to 44	7	10
45 to 54	24	29
55 to 64	33	23
65 or over	31	32
Refused	--	3
Gender	2009	2010
<i>Sample size</i>	55	62
Female	62%	69%
Male	38	31

More than two out of five respondents (45%) had high school graduation certificates while approximately one out of four respondents had less than high school graduation certificates. Fewer than one in ten (8%) held university certificates or diplomas. Two out of five of the respondents (40%) had total annual household incomes of less than \$15,000. (Table 4-23)

Table 4-23: Education and Income

Education	2009	2010
<i>Sample size</i>	55	62
Less than high school graduation certificate	53%	27% ^β
High school graduation certificate and/or some post secondary	24	45 ^β
Trades certificate or diploma	4	6
College certificate or diploma	13	11
University certificate or diploma	7	8
Refused	--	2
Income	2009	2010
<i>Sample size</i>	55	62
Less than \$15,000	47%	40%
\$15,000 - \$24,999	31	31
\$25,000 - \$34,999	7	5
\$35,000 - \$49,999	2	2
\$80,000 or more	2	--
Refused	11	23 ^β

^β Significantly different from 2009 LI REAP sample at the 90% confidence level.

Appendix A Billing Analysis Methodology

Detailed Methodology to Develop the Participant Analysis Group

The first step in the analysis of the Low Income Household Program was to identify all participants that could contribute to the analysis. To this end, Nova Scotia Power constructed a data set of all known 2009 participants' electric usage history. This data set contained information for 332 participants.

Once each billing data set was constructed it was merged with site specific information (installation date and tracking estimate of savings).

Methodology to Develop the Control Group

The control group for the LIH program was developed following a four-step algorithm:

1. An appropriate pool of potential control group customers was established,
2. Criterion was developed to match control group pool customers to participants,
3. Known participants were eliminated from the control group pool, and
4. The control group pool customers were compared to each participant. Based on the established criteria, the best control group pool matches were selected.

Each of these steps is explained in detail below.

Step 1: The Establishment of a Control Group Pool

In order to develop a control group for the LIH program, Nova Scotia Power selected a large sample of non participating customers. The customers in the control group pool were examined, and if necessary, edited. This examination was consistent with the editing procedure applied to the participants.

Step 2: The Establishment of Control Group Matching Criteria

Based on the available information, criteria to match control group customers to specific participants were established. These criteria were based on annualized usage, as defined by Equation 1.

Equation 1 - The Calculation of Annualized Usage

$AU = \frac{(\sum U_i) * 365}{(\sum D_i)}$
Where;
AU = Annualized Usage
U_i = Monthly Billed Consumption
D_i = Monthly Days in the Cycle

Step 3: Eliminating Known Participants

After the initial edits, any known current LIH program participants were eliminated from its respective control group pool. This was done by matching the current participants against the control group pool database.

Step 4: The Establishment of the Control Group

During this step, each control group pool customer was compared to each participant within rate code. For each control group pool customer within a given strata, the relative deviation in annualized usage was calculated using Equation 2.

Equation 2 - The Determination of the Absolute Relative Deviation

$$ARD = \left(\frac{|U_C - U_P|}{U_P} \right) * 100$$

Where;

ARD = Absolute Relative Deviation

U_C = Annualized Usage for Potential Control Group Member

U_P = Annualized Usage for Participant

For each participant, the control group pool customers with the smallest absolute relative deviation in the annualized usage were chosen. These control group matches were then examined further.

Based on the matching of the program participants, each selected control group member was assigned an installation date. This information was used to split the billing data of the customers in the control group into pre- and post installation periods that are consistent with that of their matched participant.

Next, each member of the control group was checked to confirm that they had enough pre-installation and post installation billing data to be analyzed. This editing process was consistent with that applied to the participant group.

The best control group match was always chosen. These were the best four matches with the smallest annual usage relative deviation. These customers were designated the control group.

The control group was chosen *with replacement*. Selecting a sample with replacement allows a customer to have the potential of being designated a control group member for more than one participant.

Temperature Normalization Methodology

The temperature normalization procedure used in both the thermostat and audit analysis is the *Princeton Scorekeeping Model* (PRISM) algorithm. Through years of experience, KEMA has taken the fundamental concept of the PRISM methodology and refined it to produce more accurate estimates of normalized annual consumption (NAC).

The PRISM algorithm develops a mathematical model that represents the temperature to energy consumption relationship. The standard, Heating-Only version of this model is shown in Equation 3.

Equation 3 - The PRISM Heating Only Model

$$U_i = \alpha + \beta * DD_i(\tau) + e_i$$

Where;

U_i = average daily consumption in interval i.
 $DD_i(\tau)$ = average degree days in interval i, based on reference temperature τ .
 α, β = parameters to be estimated to minimize e .
 e = a random error term.

The PRISM model reflects that a customer's energy usage is equal to some base level α , and that there is a linear function between a reference temperature τ , and the outside temperature. The constant proportionality, β , represents a customer's effective heat-loss or heat-gain rate.

PRISM recognizes that each customer has unique space conditioning operating characteristics. To capture these unique space-conditioning characteristics, PRISM examines a range of heating and cooling reference temperatures. The model chosen to represent a customer's energy use is the model that best linearizes the relationship between usage and degree-days. For each customer, an optimal model based on a unique reference temperature (τ) is identified by the minimum mean squared error (MSE) of the regression.

Once the optimal parameters have been established, normalized annual consumption is estimated using Equation 4.

Equation 4 - Determination of Normalized Annual Consumption (NAC) ²¹

$$NAC = 365 * \alpha + \beta * DD_o(\tau)$$

Where:

DD_o is the number of degree days expected in a typical year.

When this model is applied to a home's heating characteristics, it is referred to as the *heating only model* (HOM). When this model is applied to a home's cooling characteristics, it is referred to as the *cooling only model* (COM).

For the analysis of electric consumption data, it was not known whether or not the participants or control group members had significant space conditioning load. Therefore, the first adaptation of the PRISM methodology was to consider a *heating and cooling model* (HCM), along with the standard PRISM

²¹ For a more comprehensive technical discussion of PRISM, see Impact Evaluation of Demand-Side Management Programs, Volume 1: A Guide to Current Practice, EPRI Report CU-7178,V1, pages 5-6.

heating only or *cooling only* models. The expansion of the standard PRISM approach to consider heating and cooling loads is calculated using

Equation 5 - PRISM Heating and Cooling Model

$U_i = \beta_0 + \beta_1 * HDD_i(\tau_1) + \beta_2 * CDD_i(\tau_2) + e_i$	
Where:	
U_i	= The electric usage during cycle i.
$HDD_i(\tau_1)$	= The heating degree days based on reference temperature τ_1 , during cycle i.
$CDD_i(\tau_2)$	= The cooling degree days based on reference temperature τ_2 , during cycle i.
β_i	= The coefficients to be estimated to minimize the error term.
e_i	= The error in predicting U.

As with the standard PRISM procedure, the optimal heating and cooling model is determined by calculating the regression models assuming various reference temperature values (τ_1 and τ_2). Expected annual degree-days are applied to the optimal model to calculate a normalized annual consumption (NAC). The results of the model can be interpreted as:

- β_0 is an estimate of the average base load for a cycle;
- β_1 represents the heating slope, or the increase in electric usage for each incremental increase in heating degree days; and,
- β_2 represent the cooling slope, or the increase in electric usage for each incremental increase in cooling degree-days.

The standard PRISM approach uses usage and degree-day data on a billing cycle basis. However, the data has an inherent variability associated with the varying lengths of billing cycles. For the estimation of the heating and cooling slopes (β_1 , and β_2) the effects of the varying lengths of the billing cycle are mitigated. This is a result of the number of degree-days being directly correlated to the number of days in the cycle. However, the estimates of base load (β_0) reflect the average base load per cycle and does not account for the days in the cycle. In effect, this estimate infers the base load will be (β_0), regardless of the length of the cycle. Since base load usage is a function of time, this result may introduce a slight bias into the calculation. To eliminate this bias, the augmented PRISM approach uses usage per day as the dependent variable, and expresses the degree days on a per day basis.

Alternative models, with different numbers of independent variables, introduce a challenge to choosing an optimal model. The standard PRISM approach relies on the maximization of R^2 to indicate the optimal model. However, in building mathematical regression models, the R^2 statistic has a tendency to increase as the number of independent variables increases. Therefore, when comparing models with different numbers of regressors, the maximum R^2 criteria may not lead to choosing the optimal model between alternative models. To avoid this possibility, an alternative method to determine the optimal model was used. The minimization of the mean squared error of the residuals (MS_E) is a good alternative. The MS_E accounts for the decrease in the degrees of freedom when an additional regressor is added to the equation.

Therefore, the model that minimized the MS_E was chosen as the optimal model to represent the temperature versus usage relationship.

Lastly, in an effort to obtain the most accurate models possible, a system of re-analyzing poor performing models was developed. A “poor performing model” is defined as one that produced a low R^2 statistic.

The determination of the optimal model used a four-step approach. These steps are:

1. The optimal models are determined using all available data.
2. If the optimal model produced in Step 1 has a poor R^2 , the usage data point with the largest prediction error was omitted. Using this trimmed and edited data set the models were re-estimated.
3. Choosing the optimal model for each customer from the first two steps, the customers with poor R^2 are again identified. For these customers, the usage data was limited to the most recent year of information. Using this trimmed data set, the models were re-estimated.
4. The models developed for each customer in each of the first three steps are compared. The optimal model (i.e., the model that minimizes RMSE) was chosen.

Normal temperatures were applied to the optimal models generated by this algorithm. The estimates produced are the Normalized Annual Consumption (NAC) for each period.

Energy Impact Analysis Methodology

In the evaluation of the LIH program, the following two different methods were used. First, the energy impact was determined using an Augmented Comparison Method (PRISM). The second approach was a Regression Approach. This section discusses the methodology used to determine the energy impacts of the LIH program.

The Augmented Comparison Approach

An augmented comparison approach controls for weather and other factors using a representative control group and simple equations. After the normalization of the participant and control group bills (see Temperature Normalization Methodology), the difference between the pre-program and post-program NACs were used to determine the gross energy savings that can be attributed to the program. The determination of energy savings is calculated using Equation 6.

Equation 6 - The Augmented Comparison Approach Determination of Savings

$$S_{\text{gross}} = \text{NAC}_{\text{Pre-Program}} - \text{NAC}_{\text{Post-Program}}$$

To account for exogenous influences, the gross savings can be adjusted by using a representative control group. If it is assumed that the same outside influences are affecting both the control and participant groups, then the adjustment will yield an estimate of energy savings that are isolated from all other influences. Determining the pre- and post-program NACs for both the participant and control groups makes this adjustment. The estimated savings are calculated by adjusting the participant results by the control group results. This adjustment is shown in Equation 7.

Equation 7 - The Augmented Comparison Approach, Determination of Net Savings

$$S_{adjusted} = NAC_{pre-program}(P_i) * \frac{NAC_{Post-Program}(C_i)}{NAC_{Pre-Program}(C_i)} - NAC_{post Program}(P_i)$$

Where:

C_i = The average of control group members associated with participant i .

P_i = Participant i .

While this method is simple, it can obscure real program effects and usually produces a high variability around the estimate.

The Regression Approach

The regression analysis was performed using a comprehensive and systematic approach. This approach, presented below, has been applied with great success to the analysis of conservation programs. Specifically, this regression approach consisted of four steps that result in the selection of an optimal model that accurately quantifies the program impact. This sub-section describes the four steps of the regression approach.

Step 1: The Simple Model

During this step an initial regression model is developed using Ordinary Least Squares ("OLS"). This simple model determined the effect of one important change variable (i.e., the participation indicator variable status, or the participants engineering estimate of savings) on energy savings while controlling for all other changes. The basic form of this model is shown in Equation 8.

Equation 8 - The Simple Regression Model

$$NAC_{post,i} = \beta_0 + \beta_1 NAC_{Pre,i} + \beta_2 P_i + \epsilon_i$$

Where:

$NAC_{post,i}$ = Post Installation Normalized Annualized Consumption for customer i

$NAC_{pre,i}$ = Pre Installation Normalized Annualized Consumption for customer i

P_i = Participation Indicator Variable or Engineering Estimate of Savings

ϵ_i = Prediction error

Engineering estimates of savings were examined as a possible explanatory variable, but were found to limit the analysis, and to an unrepresentative sub sample of participants. Accordingly, the variable was defined as the participant indicator variable times the pre-installation NAC. Variations of models incorporating variable load and combination of pseudo savings with the participation variable were investigated. The final model chosen is shown in Equation 9.

Equation 9 - The Final Regression Model

$$NAC_{post,i} = \beta_0 + \beta_1 * NAC_{Pre,i} + \beta_2 * P_i * NAC_{Pre,i} + \varepsilon_i$$

Step 2: Regression Diagnostics

As a result of the residual standard deviation related to the size of the customer's energy usage, one regression assumption most often violated is that the standard deviation of the error terms, (or "residuals") is not constant across the range of predicted values. When the residual standard deviations are related to the predicted values, the model is said to be "heteroscedastic." Heteroscedasticity can often be detected in cross sectional models used to analyze program impacts. During this step, verification that the regression assumptions are valid is performed. If the initial regression model is found to be "heteroscedastic" further regression analyses are performed. These analyses were performed using a Weighted Least Squares ("WLS") approach.

Step 3: Weighted Least Squares

As discussed above, one of the fundamental regression assumptions is that the standard deviation of the error terms (or residuals) has a constant variance across the range of predicted values. When the residuals are related to the predicted values, the model is said to be heteroscedastic. Heteroscedasticity is a violation of one of the basic regression assumptions and could result in the mis-specification of mathematical relationships. As a result of the residual standard deviation being related to the size of the customer's energy usage, heteroscedasticity is often detected in cross sectional models used to analyze program impact.

When heteroscedasticity is present, an OLS approach to establishing the relationship between the dependent and independent variables may be inappropriate. An OLS approach that does not correct for the heteroscedastic relationship of its residuals will yield confidence intervals²² that are misleading. More specifically, when heteroscedasticity is present, the OLS regression coefficients are unbiased estimates of the true parameters, but they are subject to greater statistical variation than the appropriate estimates. Moreover, the standard errors produced by the OLS regression analysis are biased estimates of the true standard deviations of the regression coefficients.

WLS is one approach to correct for heteroscedasticity in regression analysis. According to econometric theory, the advantages of WLS are:

²² Even though it is the best possible estimate given the data, it is unlikely that the point estimate will exactly equal the true, unknown parameter being estimated. Accordingly, instead of using a single value to estimate the true, unknown value, it is common to use a set of values or a *confidence interval*. A confidence interval is a range of values between which we can define a statistical probability, based on the estimate variability that the true value will fall. Generally, the higher the probability, the wider the confidence interval. Usually, the confidence interval is stated in terms of the probability that the true value will fall within plus or minus the interval around the point estimate. For example, given a 90% confidence level (the probability), the true mean will fall within $\pm 5\%$ of the estimated mean.

- a) Under a properly specified heteroscedastic model, WLS yields the best linear unbiased estimates of the true parameters and,
- b) WLS gives an unbiased estimate of the variance of the estimators, providing appropriate confidence intervals and p-values.

In other words, WLS provides the most reliable estimate of savings and an accurate measure of the resulting reliability. The theory of WLS depends on a correct specification of the heteroscedasticity. The theory assumes that a positive-valued variable can be specified; say z , such that the residual standard deviation is proportional to z . Usually, z is taken to be some measure of size (for example, the pre-retrofit NAC consumption).

The benefits of WLS depend on the correct choice of z . Therefore, it is useful to have a way of comparing alternative candidates for z . If it can be confirmed that heteroscedasticity is present, the following procedure²³ is employed:

1. Postulate a family of possible candidates for z . In the following analysis, the regression has been estimated assuming that the residual standard deviation is proportional to pre-retrofit NAC dampened by raising this variable to some power between 0 and 1. This variable will be termed $(\text{NACPre})^\gamma$, where $\gamma \geq 0$. Here the exponent, gamma, is an unknown parameter that creates a family of candidate choices of z .
2. For each candidate of z , geometrically standardize z by dividing each value of z by the geometric mean of the n sample values of z . The geometric mean is the n th root of the product of the n values of z .
3. Fit the regression model using WLS with each geometrically standardized z , and calculate the root mean square error (RMSE) of each regression model.
4. Minimize the RMSE to find the best choice of z and use this particular WLS regression to obtain the best estimate of savings.

During this step, a residual analysis is performed. If heteroscedasticity is suspected, the models are estimated using WLS.

Step 4: Calculation of Energy Savings

The final step in the analysis estimates the energy savings by using the resultant models.

²³ The justification for this approach is from the statistical theory of maximum likelihood estimation. Although the WLS is different, the mathematical derivation of the methodology is the same as used by Box and Cox in their paper *An Analysis of Transformations*, (Journal of the Royal Statistical Society, Series B, 1964). A good summary of the approach is given in the text *Econometrics*, by G.S. Maddala, McGraw-Hill, 1977, pp. 315-317. J. Kmenta gives a similar methodology in *Elements of Econometrics*, to deal with autoregression in time series analysis.

Appendix B Additional Survey Results

Table B-1: Inhabiting same house in program

	Respondents
n	55
Yes	100%

Table B-2: Reasons for Participating

	Most Important Motivation	Second Most Important Motivation
<i>Sample size</i>	55	59
To save energy	27%	15%
To save money on my electric bill	25	25
No cost for services	22	9
Comfort	15	7
To receive a new refrigerator	--	2
To receive free CFLs	2	--
To help the environment	--	3
Older home	2	--
Other	2	14
Don't know	6	31
Refused	--	3

Table B-3: Reason for Dissatisfaction

Respondents	n
<i>Overall</i>	
"snarky" when respondent made inquires of the program	1
Energy Audit	
Auditor "skipped out on jobs"	1

Table B-4: Barriers to Action

Faced Barriers	Respondents
<i>Sample size</i>	55
No	96%
Yes	4

Table B-5: Impact of Measures

	2009							2010						
	<i>n</i>	Rating: 5= 'considerable improvement' and 1 = 'no improvement'						<i>n</i>	Rating: 5= 'considerable improvement' and 1 = 'no improvement'					
		5	4	3	2	1	DK		5	4	3	2	1	DK
Comfort of the house	55	44%	31	18	2	4	2	62	48%	13	11	13	8	6
Value of the house	55	29%	26	26	9	6	6	62	23%	6	18	10	8	35
Reduction in energy bills	55	26%	26	20	6	9	15	62	26%	15	6	11	13	29
Your energy efficiency interest	55	46%	27	26	--	2	--	62	42%	19	11	8	11	8
Your energy efficiency knowledge	55	44%	26	22	7	--	2	62	19%	27	24	10	8	11

Appendix C Interview Guides

Participant Questionnaire: Low Income Households questionnaire

I1. Hello may I please speak with [INSERT NAME]?

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

INTRODUCTION

SC1. My name is _____, from NMR (if needed: Nexus Market Research) on behalf of the REAP (Residential Energy Affordability Program) from Nova Scotia Power and Conserve Nova Scotia. We understand you participated in this program. Is that correct?

IF PARTICIPANT IS NOT SURE OR DOES NOT RECALL: The REAP 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]
2. 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 REAP 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 [THANK AND TERMINATE]
4. Refused [THANK AND TERMINATE]

I am NOT calling about your electricity bill or selling anything. We would like to learn a bit about your experience with participating in the REAP program. Your opinions are very important to us and your responses will be kept strictly confidential. [IF NEEDED, READ, “The survey should take about 15 minutes.”]

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

[SCHEDULED, IF NECESSARY, FOR: _____]

SC2. Do you primarily heat your home with electricity?

1. (Yes)
2. (No)
8. (Don't know)
9. Refused

SC3. Do you use ELECTRICITY to heat the hot water heater in your home?

1. (Yes)
2. (No)
8. (Don't know)
9. (Refused)[IF SC2 OR SC3 = 1 (YES), CONTINUE. OTHERWISE, THANK AND TERMINATE]

Section 1 - Screening, Reasons for participating and Overall satisfaction with the program

1. How did you first learn about the REAP program? [DO NOT READ. ACCEPT MULTIPLE]

1. (While applying for fuel assistance)
2. (Someone called me about the program)
3. (I received a letter about the program)
4. (Through [AGENCY CONTACT])
5. (My neighbor, friend, co-worker, or family member told me about it)
6. (Newspaper)
7. (Other) [SPECIFY _____])
 8. Don't know
 9. Refused

1a. Do you still live in the house that was part of the Residential Energy Affordability Program (REAP)?

1. Yes [GO TO Q2]
2. No – [CONTINUE] _____
8. Don't Know [ASK FOR THE PERSON WHO WOULD KNOW]
9. Refused [THANK AND TERMINATE]

[IF 1a = NO READ: Please answer the survey questions based on the house that went through the program.]

2. What was the ONE most important reason you chose to participate in the program? [SAME LIST AS Q#3. ACCEPT ONE RESPONSE] [DO NOT READ]

3. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE]

- 1 (To save money)
- 2 (save on my electricity bill)
- 3(To receive a new refrigerator)
- 4(My old refrigerator was not working well)
- 5 (comfort)
- 4(To receive free compact fluorescent bulbs)
- 5 (Improve resale value)
- 6(To save energy)
- 7(To help the environment)
- 8(reduce greenhouse gases)
- 9(Other) [SPECIFY_____])
- 10(No cost for services/program was free)
- 88 (Don't know)
- 99 (Refused)

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

- 1. Yes [ASK Q#5]
- 2. No
 - 8. Don't know
 - 9. Refused

5. [IF Q#4 = 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. (Other) [SPECIFY _____])
- 6. (Concern that participation will affect eligibility for other assistance programs – social assistance, heating assistance rebate)
 - 8. Don't know
 - 9. Refused

6. Thinking of your OVERALL experience with the Residential Energy Affordability Program (REAP), 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
 - 8. Don't know

9. Refused

7. [IF DISSATISFIED—Q#6= 4 or 5] You indicated that you were not satisfied with the program overall. What was the ONE most important reason you were dissatisfied with the program overall? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE – SAME LIST AS Q#8]
8. Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]
1. (The time between initial evaluation and upgrade installation took too long)
 2. (I expected more)
 3. (I don't like the refrigerator I received)
 4. (I don't like the light bulbs I received)
 5. (I did not like the evaluator who visited the home)
 6. (Other) [SPECIFY _____]
 8. Don't know
 9. Refused

Now I am going to read a list of specific aspects of the REAP 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.

	VS	S	Neither	Dissat	V.Dissat	DK/Ref
9a. Overall communication from the REAP program	1	2	3	4	5	9
9. Energy Evaluation [PROMPT, IF NECESSARY: This is an inspection and analysis of your home's energy use that was performed by an energy professional.]	1	2	3	4	5	9
10. Scheduling of Work	1	2	3	4	5	9
10a. Time Required to Complete Work	1	2	3	4	5	9
11. a. Energy Evaluation Evaluator	1	2	3	4	5	9
b. Courteousness of Energy Evaluator	1	2	3	4	5	9
12. a. Energy Efficiency Presentation	1	2	3	4	5	9
b. Energy Evaluation Report with Recommendations	1	2	3	4	5	9
c. REAP contractor/worker	1	2	3	4	5	9
13. a. Energy conservation measures installed	1	2	3	4	5	9
b. Quality of the work completed	1	2	3	4	5	9

14. [IF DISSATISFIED WITH ENERGY EVALUATION—Q#0=4 or 5] You indicated that you were not satisfied with the energy evaluation that was done of your home. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE – SAME LIST AS Q#15]

15. Were there any other reasons you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

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 light bulbs I received)
 5. (I did not like the evaluator who visited the home)
 6. (Other) [SPECIFY _____])
 8. Don't know
 9. Refused
16. Has the information you received from the energy evaluation changed your behavior in terms of how you use energy at home?
1. Yes [ASK Q#17]
 2. No
 8. Don't know
 9. Refused
17. [IF Q#16=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. (Other) [SPECIFY _____])
 8. (Close doors and windows)
 9. (Turn off appliances)
 98. Don't know
 99. Refused

Section 2 - Verify actions recorded in the tracking database

20. I am going to read you a list of measures that, according to our records, were installed in your home by the program: [READ WHAT IS ON RECORD]. 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, 8=REFUSED, 9=DON'T KNOW)

1. Building envelope measures such as: insulation, air sealing, weather stripping, or exterior door installation or replacement (*Electric Space Heated Homes Only*)
2. Programmable thermostats (*Electric Space Heated Homes Only*)
3. Tank wrap for electric hot water heater (*Homes with Electric Hot Water*)
4. Pipe wrap for exposed hot water pipes (*Homes with Electric Hot Water*)
5. Low flow showerheads (*Homes with Electric Hot Water*)
6. Low flow faucet aerators (*Homes with Electric Hot Water*)
7. Incandescent lamp replacement with CFLs (compact fluorescent bulbs)
8. Halogen torchiere replacement with CFL torchiere
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 stand-alone freezer replacement
12. Second refrigerator and freezer removal
13. Electric kettle with auto shut-off
14. Power bars to facilitate reduction in standby electricity loss
15. Any other? [SPECIFY_____])

Section 3 - Actions taken in addition to those in the tracking database

21. Were there any other energy savings actions you took on your own IN ADDITION to what was provided by the REAP program? [RECORD AND LIST ANY MENTIONED]

1. Air sealing / (weather stripping)
2. Appliances (Energy Efficient)
3. Doors & Windows Replaced
4. Heating system
5. Water heating & usage_____
6. Other (Specify)

Section 4 - Satisfaction with the effects of the energy conservation measures on their energy bills

22. How long has it been since the REAP program installed energy savings measures in your home?

- 1 Less than one month
- 2 One to six months
- 3 Seven months to a year
- 4 More than one year
8. Don't know
9. Refused

23. Since these measures were installed, what changes, if any, have you noticed in your energy bills?

1. Bills have gone down
2. Bills have gone up
3. No change in the bills
8. Don't know
9. Refused

23a. What are your approximate energy savings since taking part in the REAP program:

1. % per month _____
2. OR % per year _____
3. OR \$ per month _____
4. OR \$ per year _____
8. Don't know
9. Refused

24. Can you tell me how satisfied you are with the impact on your energy bills of the energy conservation measures provided by the REAP 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
8. Don't know
9. Refused

Section 5 - Impact of measures on comfort level

25a. Please indicate how each of the following has changed since participating in the REAP Program. On a scale of 1 to 5, with 1 “no improvement” and 5 means a “considerable improvement”) how much has _____ improved? (R2)

- 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 _____

25. B. Can you tell me how these energy savings measures and services installed by the program in your home have impacted your COMFORT LEVEL? Have they: [RANDOMIZE 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
- 7. Other [SPECIFY _____])
 - 8. Don't know
 - 9. Refused

Section 6 - Value of the program to customers

26. Overall how would you rate the value of the REAP program to you and other occupants of your home? On a scale from one to five, where one is LITTLE VALUE and five is IMMENSE VALUE, how would you rate the overall value of the program?

[ENTER VALUE] ____

27. Would you recommend the REAP program to a family member or friend?

- 1. Yes
- 2. No
 - 8. Don't know
 - 9. Refused

28. [IF Q27 = 2 (NO)] If No, why: (record verbatim accept multiple responses)

28b. [If Q27 = 1 (YES)] Have you recommended the REAP program to a family member or friend?

28c. [If Q28b = 2 (NO)] Why not? (record verbatim accept multiple responses)

Section 7 - Barriers to action

29. Were there any energy efficiency measures recommended by the REAP program that you chose not install in your home?

1. Yes
2. No [SKIP TO Q#32]
 8. Don't know [SKIP TO Q#32]
 9. Refused [SKIP TO Q#32]

[IF YES TO Q#29]

30. Which measures did you choose not to install in your home?

1. Building envelope measures such as: insulation, air sealing, weather stripping, or exterior door installation or replacement (*Electric Space Heated Homes Only*)
2. Programmable thermostats (*Electric Space Heated Homes Only*)
3. Tank wrap for electric hot water heater (*Homes with Electric Hot Water*)
4. Pipe wrap for exposed hot water pipes (*Homes with Electric Hot Water*)
5. Low flow showerheads (*Homes with Electric Hot Water*)
6. Low flow faucet aerators (*Homes with Electric Hot Water*)
7. Incandescent lamp replacement with CFLs (compact fluorescent bulbs)
8. Halogen torchiere replacement with CFL torchiere
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 stand-alone freezer replacement
12. Second refrigerator and freezer removal
13. Electric kettle with auto shut-off
14. Power bars to facilitate reduction in standby electricity loss
1. Any other? [SPECIFY_____])

31. FOR EACH MEASURE, RESPONDENT CHOSE NOT TO INSTALL: Why did you choose not to install 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 will result in lower energy bills
4. Did not trust in energy professionals installing new measures
5. Other [SPECIFY_____])

Section 8 - Interest in other possible measures

32. Are there any energy savings measures that were not covered by the program that you would like to have had installed through the program?

1. (Yes)
2. (No)
8. (Don't know)
9. (Refused)

[IF Q#32= YES] Which energy efficiency measures would you like to have installed through the program? [DO NOT READ. ACCEPT MULTIPLE]

- (dishwasher)
- (washing machine)
- (dryer)
- (windows/envelope)
- Other [SPECIFY _____])

Section 9 - Recommendations for program improvements

33. Do you have any recommendations that you think would help improve the REAP program?

Section 10 - Demographic characteristics

[ASK ALL RESPONDENTS]

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

34. What type of residence do you live in? [READ RESPONSES, DESCRIBE IF NECESSARY 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)
6. Apartment building that has fewer than five stories
7. Apartment building that has five or more stories
8. Other [SPECIFY: _____]
9. (Don't know/refused)

35. How many bedrooms are in your home? [88=DK; Enter zero for a studio apartment with no bedrooms]

36. Do you own or rent this home?

1. Own/buying
2. Rent/lease
3. Other (Describe) _____

37. Do you pay the electric bills for your home?

1. Yes
2. No
3. (Don't Know/Refused)

38. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home
7. (Other Specify _____)
8. (DK/RF)

39. 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]

40. What is your age? [DO NOT 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)
7. (Refused)

41. 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)
6. (Refused)

42. Which of the following income categories best describes your total annual household income before taxes in 2009? 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
9. (Refused)

43. [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.]

Staff Interview Guide for NSPI, 2010**Date:****Name:****Programs responsible for: Introduction:****[This interview should take about an hour]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about your role with the program:**

1. What percentage of your time do you spend on [EACH PROGRAM]?
2. What, if any, are the responsibilities of other NSPI staff members for [EACH PROGRAM]?
3. In our preliminary interview you identified the following groups and individuals that you interact with as part of the [program]...
 - a. Low Income REAP
 - i. Kate McDonald at Conserve Nova Scotia
 - ii. Delivery agents
 1. MJM Energy
 2. Clean NS
 3. Trinity Maintenance Solutions
 - iii. Low income outreach agent [Katherine Reed]
4. In general, have your interactions with these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
5. Do these programs run year round or do the start and end during the year? What is the period of the program? When did it start? When will it end?
6. What are the 2010 energy savings goals for [PROGRAM(s)]? Do you think you will achieve these goals?
7. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program(s) this year?

- a. Again at the broadest level, what were the areas that were not so successful?
- b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?

Marketing and Verification:

8. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
9. Overall, how successful has each program been so far? Why / Why not?
10. What do you think is particularly good about program delivery of each program? How could program delivery be improved?
11. Are there any safeguards to prevent free ridership in the EnerGuide programs? What are they?
12. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?
 - a. What, if any, impact has there been to the technologies covered by [program] due to Conserve Nova Scotia moving away from offering incentives for electric measures?
 - b. Are there gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by NSPI programs or any other programs? What could be done to address those gaps?

TIME PERMITTING: Review of 2009 Recommendations:

13. I am going to review some of the evaluation recommendations from 2009. For each one, please indicate whether the recommendation was considered or adopted? And, if not, why not?

Strengths and Weaknesses / Wrap-up:

14. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
15. Based on your experience with the program(s) so far, what are the most important improvements that still need to be made to the program?
16. Are there any other program issues we have not discussed that you would like to mention?
17. We are planning on conducting interviews with [below] are there any other individuals or groups we should speak to about the program?

Thank You

Staff Interview Guide for LI REAP Delivery Agents Primary Contact**Date:****Name:****Organization:****Introduction:****[This interview should take about 30 minutes]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about yourself and your role with the program:**

1. Please describe [ORGANIZATION NAME] responsibilities for the LI REAP Program.
2. Tell me about any formal or informal training you've had that helped prepare you for your work in this program. What kinds of certifications do you have? What kind of training, if any, did Conserve Nova Scotia or Nova Scotia Power provide you?
3. What training has been most helpful for your work with LI REAP? What training has been least helpful?
4. Do you feel additional training would be helpful? What kind?
5. Does [ORGANIZATION NAME] have specific goals for the 2010 LI REAP program? What are they? [PROBE IF NOT MENTIONED; are there also any energy savings goals? IF NOT MENTIONED; are there also any participant goals?] Do you think you will achieve these goals? Why? Why not?
6. About what percentage of your organization's overall business comes from the LI REAP program?
 - a. IF 50% OR MORE: Is the amount of work that you receive from LI REAP enough to keep you busy all year, or just at some times of the year? What times are you not busy enough? How does this affect your business?
7. Would you be able to handle more business from the program if it became available?
8. Describe how you are paid for your work on the LI REAP program. Are the payments timely? How might the reimbursement process be improved?
9. Is the program set up in a way that works for you and your business? What specifically works? What does not? How could the program be run better?
10. What do you see as the main goals of the LI REAP Program?

Program Coordination and Communications

11. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED: How frequent are you in contact with the program manager at Nova Scotia Power? What is the nature of these interactions? How frequently are you in contact with Kate McDonald, the program manager at Conserve Nova Scotia? What is the nature of these interactions?
12. How many vendors or suppliers do you deal with for making the energy efficiency upgrades? (IF 5 OR FEWER: What are their names?) What is the nature of these interactions? How frequently are you in contact with them?
13. What other organizations and individuals, do you interact with for this program? What is the nature of these interactions? How frequently are you in contact with them?
14. In general, have your interactions with all of these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?

Program Tracking and Reporting

15. Please describe the tracking and reporting data you provide for the LI REAP Program. In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the LI REAP Program is spent on fulfilling data tracking requirements? [PROBE IF ISSUE IS NOT BROUGHT UP: What tracking and reporting data do you provide specifically regarding electric measures that are rebated by Nova Scotia Power? In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the LI REAP Program is spent on fulfilling data tracking requirements specifically for electric measures rebated by Nova Scotia Power?

[Note: The LI REAP program has two categories of energy efficient upgrades; Scope I and Scope II. NSPI pays for the Scope I upgrades in electrically heated homes only, if the home has electric and non-electric heating then NSPI's funding to Conserve NS is proportional to the estimated use of electric space heating. When the home has multiple fuel sources the delivery agent will make a judgment call, after talking with the homeowner, on the percentage of heating supplied by each fuel source. Scope I measures include mainly building envelope upgrades such as draft proofing and insulating the basement, crawl spaces, walls and attic if required. Ventilation fans in the bathroom and programmable thermostats will be installed on a case by case basis if it is deemed necessary under the Scope I upgrades. Scope II upgrades are paid completely by NSPI for all homes regardless of their heating source. Scope II upgrades cover measures such as installing CFL's, insulating the hot water tank and piping, installing low flow shower heads and faucet aerators, providing power bars and electric kettles and replacing eligible freezers and fridges with Energy Star.]

16. In general, how well do you think the program tracking and reporting process is working? Do you believe all the necessary data is being captured and passed on to Conserve Nova Scotia? To Nova Scotia Power? If not, what data should be captured? Do you think the data is being captured and communicated in the most efficient possible way? IF NO: How could the data capture and communication be improved?
17. [IF NOT MENTIONED ABOVE] Do you maintain data on the specific measures implemented at each home, along with measure specific costs and savings estimates? Is this data in hardcopy or computerized?
18. Are there any improvements you would like to see in the data tracking process that we have not already discussed? If yes, what are they?

Program Delivery Process

19. Please describe the program delivery process, starting with the customer's first contact with you. What is the timing for each step in the delivery process; for example, how long does it take to complete the audit, provide information to the customer, install recommended measures? Do you do any follow-up after the measures have been installed? What is the timing for that?
20. Are there any factors inhibit your ability to effectively perform any part of the program delivery process? IF YES: What are they? How can these be addressed? What impact do you think addressing them will have on your effectiveness and on the program overall?
21. What impact, if any, has the introduction of additional participant names from the Low Income Outreach Agent had on the program delivery process?
22. How do you choose the vendors or suppliers to make the energy efficiency upgrades? Are there some that you work with more often than others? IF YES: Who are they and why do work with them and not with others?
 - a. Is there anything that you would change about the process of selecting vendors or obtaining or ordering supplies for the program? What would you change and why?
 - b. Do you know if the program has had any impact on the stocking practices of equipment vendors? IF YES: In what way?
23. In general, which parts of the program process do you think work particularly well? Why? Which parts work less well? Why?
24. Do you have any other suggestions for improving the program delivery process?

Customer Issues

25. In general, how aware and knowledgeable are low income consumers in your service territory about the LI REAP program? How important do you think it is to increase consumer awareness levels about the LI REAP program? Why do you feel this way? What do you think should be done to increase consumer awareness levels? What do you think are the key messages to communicate regarding the program?
26. Have you done any outreach to identify potential customers? How does this work?

27. Are there any customer segments who have really low participation in the program? Why? Are there any geographic areas where there is low program participation? Why?
28. Why do you think most customers participate in the program? What other reasons drive participation?
29. What keeps customers from participating in the program?
30. Have you received any complaints or other signs of customer dissatisfaction with the program? If yes, what was involved? If yes, how frequent is this?
31. How satisfied do you think customers are overall with the program? What feedback have you received from customers once the work on their homes is completed?

Strengths and Weaknesses / Wrap-up:

32. What would you say are the program's greatest strengths? And what would you say are the program's greatest weaknesses? What could be done to address these weaknesses?
33. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
34. Are there any other program issues we have not discussed that you would like to mention?
35. We also would like to complete an in-depth interview with one of the energy advisors who works for [ORGANIZATION]. Can you provide me with contact information for an energy advisor?

LI REAP OUTREACH CONSULTANT INTERVIEW GUIDE FOR NSPI 2010**Date:****Name:****INTRODUCTION****[This interview should take about 30-45 minutes]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

INITIAL PROGRAM BACKGROUND

We'd like to start by confirming a few things about your role with regard to the NSPI DSM programs:

1. Broadly speaking, what are the overall functions, tasks, or services that you provide for the LI REAP program?
2. Overall, about what percentage of your time do you spend on the LI REAP program?
3. Do you have any other staff or colleagues that work on the LI REAP program? IF YES: Who are they and what do they do? About what percentage of their time is spent on the LI REAP program?
4. Who do you work with at NSPI? What is the frequency and nature of your interactions with them?
5. Do you have any interactions with anyone at Conserve Nova Scotia? IF YES: Who is that? What is the frequency and nature of your interactions with them?
6. Do you have any interactions with anyone at DCS (Department of Community Services)? IF YES: Who is that? What is the frequency and nature of your interactions with them?
7. Do you have any interactions with any of the program contractors or delivery agents? IF YES: Who is that? What is the frequency and nature of your interactions with them?
8. Do you interact with anybody else for the work you do on the LI REAP program? IF YES: Who is that? What is the frequency and nature of your interactions with them?
9. In general, have your interactions with these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
10. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in marketing and promoting the LI REAP program this year?

- c. Again at the broadest level, what were the areas that were not so successful?
- d. To what do you trace the difficulties you encountered? How might they be addressed in future programs?

PROGRAM OUTREACH

- 11. Do you have any goals for the program? Are the resources allocated low-income outreach sufficient to meet your goals for the program?
- 12. In general, what is the level of awareness and knowledge of the LI REAP program in the Province? Are these acceptable levels of awareness or knowledge? Why do you say that? What can or should be done to increase the awareness of the LI REAP program?
- 13. Are there some areas or segments in which consumers have higher levels of awareness and knowledge than others? Why is that?
- 14. What do you think are their primary motivations for participating in the program? What are the major barriers to their participation in the program?
- 15. Do you think that the LI REAP program is reaching out to all qualified low-income consumers in the Province? IF NO: How can it more effectively reach them?
 - a. How easy or difficult would it be for you to increase the number of participants that you draw into the LI REAP program? IF EASY: By how what percentage do you think you could increase the number of participants you draw into the program?
- 16. Are there any customer segments who have really low participation in the program? Why?
 - b. Have you seen any interest from renters or landlords regarding participation in the program? What have you told them? Do you have any suggestions on how the program could include rentals in the program?
- 17. What do you think is particularly good about program outreach? How could program outreach be improved?

STRENGTHS AND WEAKNESSES / WRAP-UP

- 18. What would you say are the greatest strengths of the LI REAP program? And what would you say are the greatest weaknesses? What could be done to address these weaknesses?
- 19. Based on your experience with the program(s) so far, what are the most important improvements that still need to be made to the outreach activities of the LI REAP program?
- 20. Are there any other program issues we have not discussed that you would like to mention?

Thank You



Impact and Process Evaluation 2010 New Houses Program

February 25, 2011

Final Report

**Submitted to:
Efficiency Nova Scotia Corporation**

**Submitted by:
NMR Group, Inc.**

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1 Executive Summary

This report presents the results of the process and impact evaluation of the 2010 New Houses (NH) program conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

2010 was in many ways a transition year for the EnerGuide for New Houses program. In terms of program structure and design, program participation requirements were affected by the new Nova Scotia building code that was put in place as of January 1, 2010. The new code required an EnerGuide rating of 80 for all new houses (or an equivalent amount using prescriptive measures) — this used to be the minimum participation requirement for the NH program. In response, in the fall of 2010, the program changed to the PerformancePlus program and raised the minimum participation requirement to EnerGuide 83. During the same period, the program also had to face organizational uncertainties and changes. These included an impending transition of the DSM portion of the program to ENSC and having to contend with fallout from the withdrawal of Natural Resources Canada (NRCan) from the related EnerGuide for Existing Houses program.

The 2010 process evaluation was based on a telephone survey of four participating builders and 43 homeowners and in-depth interviews with one Delivery Agent and three Program Staff. The process evaluation explored issues that included program administration, satisfaction, motivation, barriers to participation and how the rebates incentivized participants to implement energy efficiency measures.

Impact Evaluation Findings

The impact evaluation was based on a review of the program records to assess the approach taken by the DSM Administrator to calculate savings, adjust the calculations as necessary and provide a revised estimate of impacts for 2010, based upon the information available as of January 17, 2011. Program free-ridership rates were calculated from the telephone survey of participants and were used to develop net savings estimates for the program. Based on this, the NMR team estimated that the generator-level impacts for the NH program in 2010 were 680 MWh of energy savings and 810 kW of demand savings. The 2010 DSM plan showed the program goal to be 2,000 MWh of energy savings and 640 kW of demand savings.¹ Thus these overall savings fell short of the program's 2010 energy savings target of 2,000 MWh, but exceeded the demand savings target of 640 kW.

Table 1: 2010 Program Savings Summary

	Peak Demand (kW)	Energy (MWh)
Gross savings at generator	1,761	1,478
Net-to-gross ratio	46%	46%
Net annual savings at generator	810	680

¹ From 2010 DSM Plan Targets Revised Jan 26 2010. Note, however, that the ENH program manual shows 2010 targets of 1,000 new houses and energy savings of 4.37 GWh; the manual did not include any demand savings target.

Findings and Recommendations

In 2010, 260 Nova Scotia residents built houses through the EnerGuide for New Houses and PerformancePlus (NH) program.² While NH program participation was much higher in 2010 than in 2009, the 2010 NH program itself had relatively less influence on energy efficiency because the 2010 Nova Scotia building code had raised energy efficiency standards to a minimum EnerGuide rating of 80, improving new home energy efficiency and making it easier for builders and owners to participate and receive incentives through the NH program.

Even with the new minimum requirement of EnerGuide 83, the program did not set significant stretch goals for participants, who could exceed this rating simply by installing a heat pump. Indeed, one of the Delivery Agents remarked that most participants were motivated to participate primarily by the heat pump incentives. An analysis of the 2010 program tracking database revealed that three out of five 2010 participants who had achieved an EnerGuide rating of 83 or higher had installed a heat pump. This suggests that for many new home builders, participation in the NH program may have in fact been driven largely by an interest in receiving incentives for installing a heat pump. Furthermore, the program also had high levels of free-ridership—79% for builders and 52% for homeowners. Thus, at first glance the NH program may have been mostly a heat pump program. That said, survey respondents reported strong interest in energy efficiency and satisfaction with the program.

Specific findings and recommendations are provided below.

² During 2010, the EnerGuide New Houses program was re-launched as the PerformancePlus program. Throughout this report we use the abbreviation NH (New Houses) to represent both the EnerGuide for New Houses program and the PerformancePlus program.

Program Participation and Incentive Structure

Finding	Recommendation
NH-F1. Implementation of the NH program entailed multiple phases and a variety of people were involved in delivering the program. Furthermore, even with the new minimum requirement of EnerGuide 83, many homes could achieve this rating simply by installing a heat pump. Thus, as noted previously, the NH program effectively appears to have become a heat pump program.	NH-R1. Under these circumstances, the program has two choices for its future direction. It The DSM Administrator should consider raising the minimum EG level to 85. This would help provide further separation from the NS building code and limit free-riders. In addition, the program should consider an incremental ratcheting up of participation requirements to an EnerGuide rating of 90 in two to three years. Alternatively, the program should consider exiting from the EnerGuide rating system and provide incentives directly for specific measures. The latter approach could potentially make for a more cost-effective and administratively efficient program.
NH-F2. Starting in January 2010, Nova Scotia building code required all new homes to have a minimum EnerGuide rating of 80. Builders or homeowners had to either have their homes' performance tested to show a rating of an EnerGuide 80 or higher or adhere to a set of prescriptive measures provided in the new building code. Building inspectors play a key role in enforcing the new energy efficiency requirements and are key stakeholders for any future residential new construction programs.	NH-R2. Before designing any future residential new construction energy efficiency programs, the DSM Administrator should work with building inspectors to understand the training they receive and their experience with enforcing building code. Building inspectors may have valuable insights into how builders choose to adhere to the new building code and the level of rigor required to do so.

Program Marketing

Finding	Recommendation
NH-F3. Despite the increased awareness about NH program in 2010 from newspaper ads or stories (cited by homeowners regarding where they learned about the program), respondents called for more marketing and advertising.	NH-R3. Continue to build awareness through marketing to homeowners in newspaper and internet advertisements as well as home shows.
NH-F4. Over one-half of homeowners in 2010 were motivated to participate in the NH program because they wanted a house that would save on energy costs and bills.	NH-R4. NH program marketing to homeowners should continue to emphasize energy cost savings from constructing a house through the program.

Program Marketing (continued)

Finding	Recommendation
NH-F5. Builders were motivated to participate in the NH program because they wanted to find out how energy efficient the new house would be in addition to helping homeowners save energy and building houses that would save on energy costs.	NH-R5. NH program marketing to builders should emphasize the ability to benchmark the energy efficiency of their construction, the market demand for energy efficient homes, and the value of having the EnerGuide label on their houses. Note that if the EnerGuide rating system were not used (i.e., incentives for specific measures mentioned in NH-R1 were used instead), this would not be an option.
NH-F6. Aside from the HOT 2000 reports and EnerGuide rating, builders received limited materials that they could use to market the home.	NH-R6. The NH program should develop an information package regarding the upgrades that builders can provide to homebuyers.

Program Administration and Delivery

Finding	Recommendation
NH-F7. The program underwent changes in the past year including changing its name as well as changes in program requirements and incentives. Builders, in particular, were confused as to whether NRCan support of HOT2000 for the program would continue.	NH-R7. ENSC should work to provide a cohesive program with effective marketing, clear requirements and definitive information about how the program will be administered going forward.
NH-F8. Builders were not clear on the different means of meeting the Nova Scotia energy code. Builder training sessions lacked sufficient details about the NH program. Builders did not understand the HOT2000 report very well in terms of how it worked and how it was measured.	NH-R8. Builder education and training needs to provide greater detail regarding the Nova Scotia building code, the NH program, and understanding the HOT2000 report and the R-2000 approach.
NH-F9. Builder training from Nova Scotia Labour & Workforce Development did not make clear that EnerGuide rating is an alternative to the prescriptive method described in the Nova Scotia building code.	NH-R9. ENSC could work with trainers at Nova Scotia Labour & Workforce Development, to explain more clearly that the NH program is an alternative to the prescriptive method.
NH-F10. Delivery Agents reported that reviewing HOT2000 reports was a time-consuming process. Program staff observed that NH program could provide more information on tracking or adjusting energy savings, and differentiating plug load from building envelope measures.	NH-R10. The NH program should work with NRCan to provide additional training to Delivery Agents on reviewing and interpreting HOT2000 reports. The program should also help Delivery Agents understand how they can track and adjust energy savings, particularly for plug load versus building envelope measures.

Program Performance and Savings

Finding	Recommendation
NH-F11. Only one of the four builders reported being satisfied with the scheduling and timing of the audit.	NH-R11. The program should work to improve the scheduling and timing of the audit. Regular communication with builders will also help improve satisfaction with this aspect of program delivery.
NH-F12. Prescriptive measures, such as solar hot water heaters and water heater tank insulation, had the potential to be double counted by being modeled in HOT2000, and then having prescriptive savings added to the per EnerGuide point savings.	NH-R12. Solar hot water heaters and water heater tank insulation should always be modeled in HOT2000. Prescriptive savings should not be applied to such measures
NH-F13. The impacts of program-sponsored CFLs could be modeled in HOT2000, but based on our review of program files it appeared that energy auditors were not modeling CFLs.	NH-R13. The program should set a precedent and either instruct auditors to always model CFLs (including their savings in the per EnerGuide point calculations) or never model CFLs.
NH-F14. Water heater pipe wrap insulation could not be modeled in HOT2000. Drain water heat recovery measures and programmable thermostats could be modeled in HOT2000, but have no effect on the EnerGuide rating or energy consumption of program homes.	NH-R14. It is appropriate to add prescriptive savings for water heater pipe wrap insulation, thermostats and drain water heat recovery measures to the per EnerGuide point savings calculations.
NH-F15. All homes that obtained their building permit and entered the program in 2010 had to adhere to Nova Scotia's new residential energy code and achieve a minimum EnerGuide rating of 80. Relative to the new code upgrade baseline home, the evaluated savings per EnerGuide point was 1,032 kWh.	NH-R15. The code upgrade baseline home (EnerGuide rating of 80) and the per EnerGuide point savings estimate of 1,032 kWh should be adopted by the NH program for tracking savings in 2011.
NH-F16. Some builders and homeowners were participating in the program because they could receive rebates for measures that had already been planned. Per Nova Scotia building code, all new houses had to achieve an EnerGuide rating of 80, and simply by purchasing a heat pump, participants could increase their EG rating to 83 and take advantage of program rebates.	NH-R16. Consider revising the program objectives and components in order to lower the administrative costs of the program and take advantage of existing energy efficiency measures occurring through the Nova Scotia building code.

Rebates

Finding	Recommendation
NH-F17. In 2010, owners could transfer rebates to builders in order to reduce up-front costs, which was an improvement over the 2009 program. In 2009, builders could only receive reimbursement for the \$250 registration fee. Nonetheless, builders typically did not receive incentives so they were sometimes slow to fill out paperwork, given that they had no monetary reward.	NH-R17. The program should consider providing more direct incentives to builders so that they become more invested in effective program administration and energy efficient outcomes.

2 Program Description and Data Tracking

2.1 Program Description

The NH program was administered by Conserve Nova Scotia (CNS). The DSM Administrator joined the program in 2009 by adding incentives for specific measures. The new independent program administrator, Efficiency Nova Scotia Corporation (ENSC), may take over administration of the program from CNS later in 2011. The DSM Administrator provides rebates for eligible new homes that have completed approved building envelope, electric space heating, electric water heating and lighting upgrades.³ The DSM Administrator provides incentives for electrically heated homes that achieve an EnerGuide score of at least 83 through the program.⁴

CNS contracted with three Delivery Agents to implement the program throughout the province. The three Delivery Agents utilized a total of eight certified Energy Advisors who modeled the house based on the building plans and recommended upgrades that improved the EnerGuide rating. A detailed design evaluation summary was provided to the applicant along with a list of potential energy efficiency upgrade options. Upon completion of construction, the evaluator verified the upgrades that had been completed and notified the homeowners about rebates that they were eligible to receive. The DSM Administrator provided incentives for the following prescriptive measures (where they pertained to electric space and/or water heating):

- ENERGY STAR® qualified ductless (“mini split”) air source heat pump
- ENERGY STAR® qualified central (“ducted”) air source heat pump
- ENERGY STAR® qualified ground source heat pump
- Electric Thermal Storage systems
- Electronic thermostats
- Drain water heat recovery
- Solar domestic water heating systems
- Electric water heater pipe wrap
- Aluminum foil or fibreglass electric water heater tank wrap
- At least 10 energy efficient lights in fixtures

³ Conserve Nova Scotia also provided rebates for other non-electric measures. The DSM Administrator paid for some or part of CNS rebates, if the home was electrically heated

⁴R-2000 is not part of the DSM program. An R-2000 certified home “has an energy efficiency Rating of EG80, plus: [Indoor Air Quality] IAQ features, environmentally friendly material choices, water conservation requirements, balanced and tested ventilation system, air tightness level of 1.5AC/H or less, a pre-drywall inspection, construction by a licensed R-2000 builder, third party warranty” (Source: <http://energuidens.com/EGNH%20Introduction.pdf>). More information on R-2000 is available at the Nova Scotia Home Builders' Association website: <http://www.nshba.ns.ca/R2000program.html>.

Through the NH program, electrically heated houses receiving a final EnerGuide rating of 85 or higher were eligible for an additional incentive of \$300. This increased substantially under when the program was re-launched as PerformancePlus in the fall of 2010 (\$3,000 for 83 or 84, \$5,000 for 85-87, and \$7,000 for 88 or higher; along with additional solar rebates). A program manual for the 2010 program that was updated in October of 2010 provided details on program design and operations.

Any new homes that had registered in Conserve Nova Scotia's NH or R-2000 Program and had not completed their final audit before August 1, 2009 or had registered in the Province of Nova Scotia's NH program after June 15, 2010 were eligible for the Electricity DSM Administrator's electricity efficiency rebates. For homes registered before September 7, 2010, registration fees were rebated if the completed house achieved an EnerGuide rating of 80 or more; houses achieving an EnerGuide rating of 85 or higher qualified for an additional \$300 rebate. For homes registered on or after September 7, 2010, the program no longer offers registration fee rebates.

2.1.1 Program Theory

Program Background

The 2010 NH program was primarily administered and funded by Conserve Nova Scotia (CNS) and encouraged new home builders in Nova Scotia to improve the energy efficiency of their houses. The program was both a Market Transformation and a Resource Acquisition program.

As a Market Transformation program, the program's goal was to shift market adoption of energy efficient measures in new homes, eventually bringing about a change in the Nova Scotia building code. This has already occurred to a certain extent; as of January 2010, Nova Scotia building code required that all new homes have an equivalent EnerGuide rating of 80.⁵

As a Resource Acquisition program, the program's goal was to improve the energy efficiency of as many new homes in Nova Scotia as possible. The program worked in conjunction with Natural Resources Canada's (NRCan) EnerGuide rating service. Funding for the program came from the provincial government (CNS) and the DSM Administrator. Participation in the program consisted of three phases: registration and modeling of new house plans, energy efficient construction and upgrades, and the audit and EnerGuide rating of the completed house.

Program Activities

- **Delivery Agent recruitment and training.** NRCan trains Delivery Agents and energy evaluators for the NH program.
- **Energy Evaluator training.** Delivery Agents hire and train energy evaluators.
- **Enlist builder and developer support.** Builders and developers are key decision-makers in the construction and specification of materials and equipment that are used in new

⁵ See page 12 <http://www.conservens.ca/resources/business-plans/ConserveNS-2009-2010-Business-Plan.pdf>.

house construction. Helping them to specify energy efficient construction practices and measures for houses will ensure long-term savings.

- **Marketing and outreach.** The program utilizes advertising directed to commercial and private builders of new homes to educate them about the benefits and cost savings of building an energy efficient house. CNS and the DSM Administrator use seminars and information sessions organized by two of the Delivery Agents to promote the program. The DSM Administrator also uses its existing contractor network to encourage program enrollment. NSPI customers receive a bill insert, on-hold messaging and an E-Bill advertisement. Municipal Electric Utility customers receive a bill insert. Information about the program is also published in articles in newspapers/renovation guides, rack information cards, and NSPI and Conserve Nova Scotia website updates. Organizations such as realtors, construction professionals and Members of the Legislative Assembly (MLA's) are targeted through articles submitted to member newsletters and other communications media.
- **Register and model house plans.** New house builders register the building plans for the new house for a registration fee of \$250. A certified Energy Advisor models the house as shown on the building plans and again with a series of upgrades which improve the EnerGuide rating to 83 or higher. A detailed design evaluation summary is provided to the applicant along with a list of potential energy efficiency upgrade options.
- **Construction activities.** New house builders perform energy efficient construction and equipment upgrades.
- **Evaluation of Completed House.** Energy Evaluators audit the completed house (including a blower door test) and verify the energy saving measures that were installed. Energy Evaluators input audited data into HOT2000 software and upload information to NRCan. Based on the results, the house is assigned a final EnerGuide rating and becomes eligible for provincial and DSM Administrator rebates.
- **Rebate Processing.** CNS invoices the DSM Administrator for applicable electricity measures. CNS provides rebates to the first owner of the completed house or the builder if the homeowner and builder agree in writing to transfer the rebate amounts to the builder to reduce the final cost of the home.

Program Assumptions

- **Builder and developer support.** Outreach activities are sufficient to motivate builders and developers to participate in the program or encourage their customers to participate in the program.
- **Customer support.** Outreach activities are sufficient to motivate customers who are building their own new homes to participate in the program.

- **Adequate availability of Energy Evaluators.** NRCan is able to train a sufficient number of Delivery Agents/Energy Evaluators to model the house plans and audit the completed house.
- **Skills and equipment.** Delivery Agents/Energy Evaluators have the skills and equipment required to complete evaluations as part of the program or they can contract for such services.
- **Availability of materials and equipment.** The materials and equipment that are specified through the program are readily available from traditional suppliers and can be installed in the new houses according to program specifications.
- **Training and skills.** Builders and contractors have the training and skills required to install more efficient measures.
- **Energy savings.** Home buyers will benefit from energy use and bills that are lower than those in a house built to the specifications in the original building plan.

Program Barriers

- **Lack of awareness of the program.** Some customers, builders, or developers may not be aware of the program and the rebates available through the program.
- **Lack of awareness of energy efficient measures.** Some customers, builders or developers may not be aware that more energy efficient materials and equipment exist.
- **Reluctance to change practices.** Some builders may be reluctant to change the way that they specify or install certain measures.
- **Perceptions of quality.** Some builders and developers may be concerned that energy efficient measures may result in more customer callbacks due to quality issues.
- **Local business associations.** Local business associations are important to the success of the NH program. A lack of interest in or knowledge of the program could lead to poor participation by local business associations.
- **Cost-driven construction and competitive markets.** Some builders or customers may be interested in building only the most economical house that meets building code and may be reluctant to spend the extra money upfront for the energy efficient measures. In particular, spec builders may not be interested in spending more on energy efficient construction because they are competing with other builders on price for what is likely to be the most expensive purchase that a consumer will make.
- **Misplaced incentives.** Home builders and developers may be reluctant to invest in energy efficient construction and equipment because they do not generally receive the

program incentives (which are sent directly to the home buyers).⁶ Participants who are building the houses for themselves may be reluctant to make investments in more efficient measures because they may not be confident that the rebates will be approved or that the longer-term bill savings will pay for measure upgrades.

- **Lack of availability of measures.** Access to more efficient heating systems, lighting, etc. is essential for builders and developers to stay on schedule. Delays or special orders of equipment and materials may result in measures not being specified or installed.
- **Inadequate or no proper training.** Builders and their contractors may not have the proper training to correctly specify and install rebated energy efficient measures and equipment, without which the measures might not be installed nor savings opportunities fully realized.
- **Builder restriction on marketing home as energy efficient.** The builder cannot market an unsold participating home as certified energy efficient because the homeowner has to sign off on paperwork from the final inspection, even though the inspection may have taken place much earlier. Thus, the paperwork can only be signed after the sale to the homebuyer and eventual homeowner after which the home can receive certification of the EnerGuide rating.

Short-Term Outcomes

- **Customers, builders and developers become aware of the program.** Customers, builders and developers are made aware of the program products through advertising, articles, local business associations, bill inserts, web sites, and other outreach efforts.
- **Energy Evaluators identify energy saving opportunities.** The reports from the modeling of the house plans that are provided to customers identify energy savings opportunities and help inform participants about what they can do to increase building energy efficiency and improve their homes' EnerGuide rating.
- **Customers, builders and developers specify more energy efficient materials and equipment in their new houses.** Customers, builders and developers are motivated to improve the energy efficiency of new houses and specify more energy efficient measures for the houses based on program recommendations.
- **Builders and developers sell energy efficient homes.** Builders and developers leverage energy efficiency measures and forthcoming rebates as a selling feature of the new homes and are able to sell the houses.

⁶ In 2010, homeowner and builders can agree to transfer the rebates to the builder in order to reduce upfront costs.

- **Home owners receive rebates and incentives.** Home owners receive rebates for applicable energy efficiency measures from the provincial government and the DSM Administrator.

Intermediate Outcomes

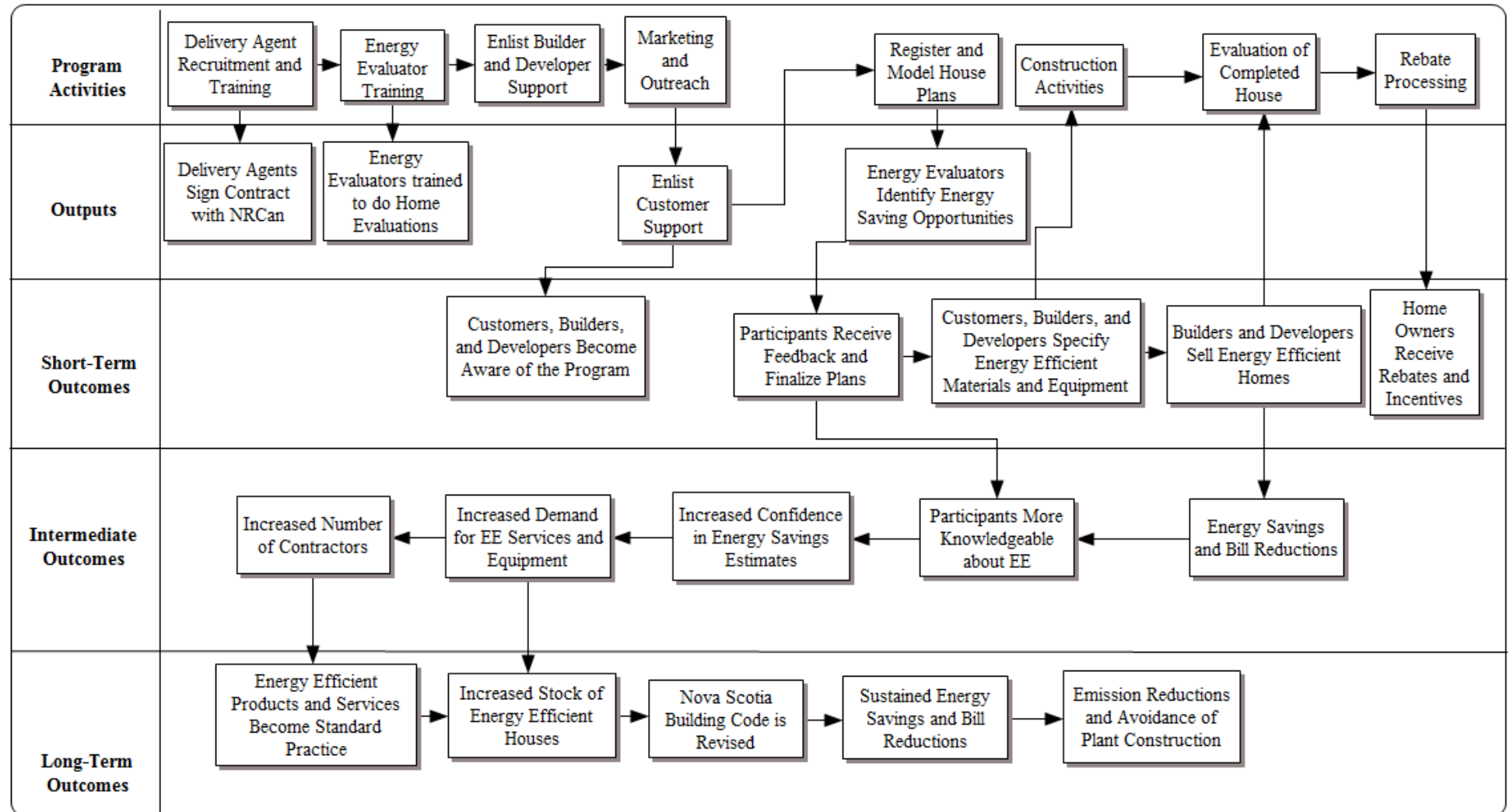
- **Energy savings and bill reductions.** Energy savings result from the upgrades installed in new houses.
- **Participants are more knowledgeable about energy efficiency.** Participants gain first-hand understanding about the benefits of building energy efficient houses.
- **Increased confidence in energy savings estimates.** Based on their experience with the NH program, homeowners will have confidence in energy savings estimates for energy efficiency improvements.
- **Increased demand for energy-efficient equipment.** Participants who build energy efficient houses recognize the benefits. They continue to specify energy-efficient construction practices and equipment.
- **Increased number of energy efficient builders and contractors.** As the program matures, there will be an increased number of builders and contractors with knowledge, experience and willingness to build energy efficient homes.

Long-Term Outcomes

- **Builders and developers incorporate energy-efficient products and services as standard practices.** Due to first-hand experience, energy efficient measures become standard practice for new house construction.
- **Customers demand energy efficient houses as standard practice.** Increased awareness about the benefits of living in an energy efficient house creates increased consumer demand for energy efficient houses.
- **Increased stock of energy efficient houses.** More and more new houses are built to energy efficient standards, increasing the stock of energy efficient houses across Nova Scotia.
- **Nova Scotia building code is revised.** Building code in the province is revised to be consistent with the widespread adoption of the energy efficient building practices.
- **Sustained energy savings.** Due to increased demand for energy-efficient houses, sustained energy savings are achieved in the residential new construction market.
- **Avoidance of plant construction.** Demand and energy savings reduce the need for new generation.

2.1.2 Program Logic Model

Figure 2-1: New Houses Program Logic Model



3 Impact Evaluation

3.1 Methodology

The NMR team's approach to evaluating the 2010 impacts of the NH program was based on a review of the program records to assess the approach taken by the DSM Administrator to calculate savings, adjust the calculations as necessary and develop a revised estimate of impacts. Similar to the impact evaluation conducted in 2009, NMR reviewed the program's tracking database to assess the approach used by the DSM Administrator to track savings.⁷ NMR extracted the square footage data from a sample of 25 program homes and updated the existing baseline home to be representative of the average dimensional characteristics from those homes. An additional baseline home was developed to reflect the residential energy code upgrade that went into effect on January 1st, 2010.⁸ Program savings were calculated using a sample of program records and the new baseline homes. Finally, we assessed the validity of using HOT2000 software to calculate savings by comparing a sample of program homes using both the HOT2000 software and the REM/Rate software.⁹

Program free-ridership rates were calculated from a telephone survey of participants and were used to develop net savings estimates for the program. A total of 47 participants were surveyed.

3.1.1 Summary of 2010 Tracked Savings

According to the program's tracking database, as of January 17, 2011, the NH program had invoiced a total of 260 homes in 2010.¹⁰ The tracked savings estimates for 2010 were 1,700 MWh at the meter and 1,900 MWh at the generator. (Table 3-1) Savings at the generator were calculated by applying a line loss factor of 1.1188 to the meter savings.

Table 3-1: Tracking Database Savings—2010 Calendar Year

Total Savings	Meter	Generator
Energy Savings (MWh)	1,700	1,900

Savings for the new houses program were calculated on a per project basis—in other words, every project was provided a unique savings value. As was the case in 2009, savings were initially estimated by calculating the difference between the EnerGuide rating of a participating home and the EnerGuide rating of the baseline home. Based on the 2009 impact evaluation of the new houses program, an EnerGuide rating of 73 was used for the baseline home, and a savings

⁷ NMR (2010). *Impact and Process Evaluation, 2009 EnerGuide for New Houses Program*. February 25, 2010.

⁸ <http://www.gov.ns.ca/lwd/buildingcode/docs/NSBuildingCodeAct.pdf>

⁹ HOT2000 is the software used to model program projects and assign them an EnerGuide rating. REM/Rate is a widely recognized building energy software that is used in the United States for many efficiency programs including the ENERGY STAR homes program.

¹⁰ Three homes were listed in the tracking data, but had not yet been invoiced and were excluded from the savings calculations.

value of 611 kWh per EnerGuide point was applied to the difference in EnerGuide ratings.¹¹ In addition, the program savings also included a host of prescriptive measures whose savings were calculated outside of the EnerGuide point system. Table 3-2 displays these prescriptive measures and their savings values from the tracking spreadsheet.

Table 3-2: Prescriptive Measures and Savings

Measures	Annual Savings (kWh)
Drain water heat recovery—30% to 41.9% efficient	820
Drain water heat recovery—42% efficient or greater	1,026
Solar domestic hot water heating system	2,080
Water heater tank wrap insulation	399
Water heater pipe wrap insulation	74
Programmable electronic thermostat	643
13 watt CFL compatible fixtures	43

NMR validated the prescriptive savings listed in the tracking spreadsheet through a review of the 2009 Low Income Households (LIH) report and the Ontario Power Authority's report titled "2010 Prescriptive Measures and Assumptions."^{[12][13]} Based on the review of these sources, NMR found that the prescriptive savings listed in the tracking spreadsheet were reasonable for all but one measure. NMR adjusted the annual savings value for programmable thermostats from 643 kWh to 63 kWh per thermostat.¹⁴ The evaluated savings value of 63 kWh was a more conservative estimate and is consistent with our evaluated savings estimate for the EnerGuide for Existing Houses program. NMR also adjusted the annual savings value applied to compact fluorescent light fixtures (CFLs) for our impact evaluation, decreasing the value from 43 kWh per fixture to 41 kWh per fixture. The 2009 LIH report recommended that an annual savings value of 41 kWh be applied to CFL fixtures.

The following equation gives an example of how savings would be calculated for a participating home that received an EnerGuide rating of 80, installed a solar domestic hot water heating system, and installed two programmable thermostats:

$$[(80_{EG\ Rating} - 73_{EG\ Base}) \times 611\ kWh] + 2,080\ kWh_{Solar} + (2 \times 643\ kWh_{Tstat}) = 7,643\ kWh$$

¹¹ NMR (2010). *Impact and Process Evaluation, 2009 EnerGuide for New Houses Program*. February 25, 2010.

¹² NMR (2010). *Impact and Process Evaluation: Low Income Households Program 2009*. February 25, 2010.

¹³ http://www.powerauthority.on.ca/sites/default/files/page/16082_2010_Prescriptive_Measures_Assumptions_List_%28Feb_1_2010%29_%28Back_Up_Feb_01%29.pdf

¹⁴ This is based on the Ontario Power Authority report. The OPA estimated savings of 63.15 kWh per electric baseboard. NMR applied this value to its evaluated savings estimates because the program only provides rebates for thermostats installed on electric baseboard heating systems.

Calculating savings in this manner allowed for double counting as some of the prescriptive measures could also be modeled in HOT2000. For example, if a solar hot water heater was modeled in HOT2000, the EnerGuide rating for that home likely increased, in turn increasing the savings calculated using the per EnerGuide point savings method; if that measure then had a prescriptive savings value added to the EnerGuide point savings value, the benefits of the solar hot water heater would be double counted. Three measures had the potential to be double counted: solar hot water heaters, hot water tank wrap insulation, and CFLs. Each of the drain water heat recovery measures and programmable electronic thermostats could be modeled in HOT2000, but including them in the model had no impact on the EnerGuide rating or energy consumption of the home.¹⁵ Water heater pipe wrap insulation was the only measure that could not be modeled in HOT2000 and, therefore, did not have the potential to be double counted.

All of the prescriptive measures, with the exception of CFLs, represented a change in the way savings were tracked in 2009. In 2009, CFLs were the only prescriptive measure for which savings were calculated independent of the per EnerGuide point savings. The reasoning behind calculating those savings independently was that HOT2000 did not adequately model the savings from efficient lighting fixtures.

3.2 Creating Baseline Homes

All homes permitted after December 31, 2009 were required to be built to the new residential building code in Nova Scotia. Therefore, we developed two baseline homes, one to address program homes permitted before December 31, 2009 (updated baseline home) and another to address homes permitted after December 31, 2009 (code upgrade baseline home).

3.2.1 Updated Baseline Home

NMR estimated that there was a six month lag between the time a home is permitted and the time it was built. Thus, any project that had been tracked through the program between January and June of 2010 was considered to be permitted under the old building code. To address these projects, NMR updated the baseline home that had been developed in 2009 to reflect the average building dimensions (e.g. ceiling area, wall area, window area, etc.) from a sample of 25 participating homes. NMR did not adjust the type of heating or water heating systems, the efficiency of heating or water heating systems, or the insulation values of the baseline home as these characteristics were likely influenced by the program.

Table 3-3 compares the sample of 25 participating projects that were analyzed and the remainder of the program's participating projects. The homes sampled appeared to be slightly more efficient than the rest of the program's projects. The 25 homes that were sampled were significantly more likely, at the 90% confidence level, to have at least one CFL and one

¹⁵ NMR modeled the updated baseline home with and without these measures to determine if they had an impact on the EnerGuide rating or energy consumption of the home. Measures were modeled in version 10.51 of HOT2000.

programmable electronic thermostat installed through the program. The sampled projects also had a significantly higher average EnerGuide rating (83.5) than all other participating projects (82.4). These results suggest that the sampled projects may have been slightly larger in size than the remaining program projects.¹⁶

Table 3-3: Comparison of Sampled Projects vs. Other Projects

Measures	Sampled Projects	Other Projects
<i>Sample Size</i>	25	235
13 watt CFL compatible fixtures	72%*	55%*
Programmable electronic thermostat	44%*	19%*
Air source heat pump with electric resistance backup	20%	21%
Ground source heat pump	12%	4%
Hot water heater tank wrap insulation	8%	3%
Air source heat pump with non-electric resistance backup	4%	3%
ETS central hydronic system	4%	9%
Drain water heat recovery—30% to 41.9% efficient	4%	--
Drain water heat recovery—42% efficient or greater	4%	2%
Solar hot water heater	4%	2%
Hot water heater pipe wrap insulation	4%	2%
Ductless air source heat pump with electric resistance backup	--	1%
Ductless air source heat pump with non-electric resistance backup	--	--
ETS room unit	--*	5%*
ETS forced air furnace	--	<1%
Average EnerGuide rating	83.5*	82.4*

*Indicates results that are significantly different at the 90% confidence interval

¹⁶ Larger homes often “score” better than homes that have identical features but are smaller—this may be one of the reasons that the EnerGuide rating was slightly higher for the sampled projects compared to the rest of the program.

Table 3-4 shows a comparison of the average 2010 participating home and the updated baseline home. The updated baseline home had an EnerGuide rating of 74 and an annual energy consumption of 33,740 kWh.¹⁷ The projects that were sampled in 2010 had larger building components than those that had been sampled in 2009. Ceiling area, wall area, window area, and volume were just some of the components that were larger in 2010 than in 2009. The combination of these larger building components led to a higher annual energy consumption for the updated baseline home compared to the 2009 baseline home. The 2009 baseline home had an EnerGuide rating of 73 and an annual energy consumption of 29,172 kWh.

Table 3-4: Updated Baseline Home Characteristics

Gross Area (ft²)	Average Participating Home-2010	Updated Baseline
<i>Sample Size</i>	25	25
Ceiling	1,263	1,263
Main wall ¹⁸	2,028	2,030
Door	83	82
Exposed floor	172	172
Windows	277	277
Floors above basement	1,034	1,034
Basement walls above grade	129	130
Basement doors	26	26
Basement windows	61	62
Basement floor deader	142	142
Basement pony walls	528	524
Basement below grade foundation	1,558	1,557
Volume (ft ³)	23,789	23,789
EnerGuide rating	83.5	74
Annual Electricity Consumption (kWh)	22,994	33,740

3.2.2 Code Upgrade Baseline Home

As previously mentioned, NMR assumed that there was a six month lag between the time a home was permitted and the time that it was actually built. Based on this assumption, any home completed after June 30, 2010 would have been permitted after December 31, 2009, and would have been built to meet the new residential building code. For this reason, NMR developed an additional baseline home to address any participating home that was built after June 30, 2010.¹⁹

NMR applied the same building dimensions listed in Table 3-4 to create the code upgrade baseline home. However, the code upgrade baseline home was modeled to reflect the requirements of the new code; these included the prescriptive insulation requirements as well as the space heating and domestic hot water equipment minimum efficiency standards. Table 3-5

¹⁷ The 2009 baseline home had an EnerGuide rating of 73—one point lower than the updated baseline home.

¹⁸ The main wall area includes the floor header for the above grade floors.

¹⁹ NMR assumed that the month a project was listed under in the tracking database was the month that the home was completed.

compares the insulation and efficiency characteristics of the updated baseline home and the code upgrade baseline home. NMR modeled the code upgrade baseline home to have an EnerGuide rating of 80; under the new code, any home using a performance path to comply with code had to achieve an EnerGuide rating of 80.^{[20][21]} The estimated annual energy consumption of the code upgrade baseline home was 26,605 kWh, while the consumption of the updated baseline home was 33,740 kWh. This represents a difference of 7,135 kWh between the two baseline homes. (Table 3-5)

Table 3-5: Comparison of 2010 Baseline Homes

Building Component	Updated Baseline	Code Upgrade Baseline
Foundation wall insulation (R-value)	12	22
Slab (R-value)	0	10 ²²
Exposed floors (R-value)	12	31
Floor header (R-value)	12	24
Above grade wall (effective R-value) ²³	20	22.3
Window (average effective R-value)	2.00 ²⁴	2.99 ²⁵
Doors (R-value)	6.47	6.47
Ceiling (effective R-value)	40	51.2 ²⁶
Electric baseboard heating (capacity kBtuh) ²⁷	44.35	35.82
Conventional water heater (energy factor) ²⁸	0.88	0.91
Air leakage (ACH @ 50 Pa)	3.57	1.50
EnerGuide rating	74	80
Annual Electricity Consumption (kWh)	33,740	26,605

²⁰ Nova Scotia Labour and Workforce Development, *Nova Scotia Building Code Regulations* (Halifax, NS 2009), 112.

²¹ After adjusting the insulation values and the efficiency of the water heating system, the code upgrade home initially achieved an EnerGuide rating of 78. We adjusted the air infiltration values and the ceiling insulation of the home to achieve an EnerGuide rating of 80.

²² R-10 under the slab, no perimeter slab insulation.

²³ Effective R-value is the R-value of all the wall components combined (e.g. drywall, insulation, framing, sheathing, and siding).

²⁴ Average effective solar heat gain coefficient (SHGC) of 0.59.

²⁵ Average effective SHGC of 0.51.

²⁶ The prescriptive value for the new code is R-40, but we adjusted the ceiling insulation value to achieve an EnerGuide rating of 80 without having an abnormally low air leakage value.

²⁷ Electric heating systems are assumed to be 100% efficient.

²⁸ We assumed a standard 50 gallon storage tank for water heaters. This is the same assumption that was used in the 2009 baseline home.

3.3 Incremental EnerGuide Point Savings

In 2009, NMR recommended a savings value of 611 kWh per EnerGuide point. As part of our 2010 evaluation NMR sought to update this value based on a sample of 25 program homes. To update the per EnerGuide point savings value NMR compared the modeled electricity usage of these 25 participating homes to each of the new modeled baseline homes.

Using HOT2000, NMR determined that the average annual energy consumption for each of the 25 participating homes sampled was 22,994 kWh, with an average EnerGuide rating of 83.5. (Table 3-4) This represented an EnerGuide rating difference of 9.5 points over the updated baseline home and energy savings of 10,746 kWh per year. NMR divided the annual energy savings by the EnerGuide rating difference resulting in an annual savings value of 1,131 kWh per EnerGuide point using the updated 2010 baseline home. (Table 3-6) The 2010 EnerGuide point savings represented a substantial increase over the 2009 savings estimate of 611 kWh per EnerGuide point. There were two primary reasons for this difference:

- 1) The average participating home sampled in 2010 had larger building components than the average participating home sampled in 2009, which increased the energy consumption of the updated baseline home vs. the 2009 baseline home (33,740 kWh vs. 29,172 kWh respectively).
- 2) The average participating home sampled in 2010 was slightly more efficient than the average participating home sampled in 2009. The annual energy consumption of the average participating home sampled in 2009 was 23,799 kWh compared to 22,994 kWh in 2010.

These factors resulted in higher electricity savings between the baseline home and the average participating home sampled in 2010 vs. 2009. In fact, the average electricity savings in 2010 (10,746 kWh) represented a 100% increase over the electricity savings in 2009 (5,374 kWh). NMR calculated the EnerGuide point savings by dividing the electricity savings by the difference in EnerGuide ratings. So, while the average EnerGuide point difference was actually higher in 2010 (9.5) than it was in 2009 (8.8), leading to a higher denominator for the calculations, the increase in electricity savings was large enough to produce the increase in EnerGuide point savings.²⁹

²⁹ The energy consumption and EnerGuide rating of a home is not necessarily a 1:1 relationship. This is why we see an increase in both the energy consumption and EnerGuide rating of the baseline home from 2009 to 2010.

Table 3-6: Estimated Electricity Savings per EnerGuide Point using Updated Baseline Home (EnerGuide Rating of 74)

	EnerGuide Rating	EnerGuide Rating Difference	Annual Electricity Usage (kWh)	Annual Electricity Savings (kWh)	Annual Electricity Savings per EnerGuide Point (kWh)
Updated baseline home	74	n/a	33,740	n/a	n/a
Average participating home	83.5	9.5	22,994	10,746	1,131

Performing the same analysis with the code upgrade baseline home resulted in an EnerGuide rating difference of 3.5 between the average participating home and the code upgrade baseline home. The annual electricity savings were 3,611 kWh, resulting in an annual savings value of 1,032 kWh per EnerGuide point. (Table 3-7) These results were not directly comparable to the 2009 EnerGuide point savings estimate as the code upgrade baseline home incorporated different envelope and efficiency characteristics than the 2009 baseline home.

Table 3-7: Estimated Electricity Savings per EnerGuide Point using Code Upgrade Baseline Home (EnerGuide Rating of 80)

	EnerGuide Rating	EnerGuide Rating Difference	Annual Electricity Usage (kWh)	Annual Electricity Savings (kWh)	Annual Electricity Savings per EnerGuide Point (kWh)
Code upgrade baseline home	80	n/a	26,605	n/a	n/a
Average participating home	83.5	3.5	22,994	3,611	1,032

3.4 Program Impacts

The NMR team applied the new per EnerGuide point savings for each of the baseline homes to the tracking data to develop impact estimates for the 2010 new houses program. The updated baseline home (EnerGuide rating of 74) was used to calculate the savings of projects tracked between January and June of 2010, while the code upgrade baseline home (EnerGuide rating of 80) was used for projects tracked between July and December of 2010. This approach assumed that homes built in the first six months of 2010 were built under the old code, and homes built in the last six months of 2010 were built under the new code. Table 3-8 displays a comparison of the EnerGuide ratings and per EnerGuide point savings estimates used in the program tracking database and in our impact analysis.

Table 3-8: Comparison of Baseline Homes and per EnerGuide Point Savings

	Baseline Home EnerGuide Rating	Electricity Savings per EnerGuide Point (kWh)
Tracking database	73	611
Updated baseline home	74	1,131
Code upgrade baseline home	80	1,032

NMR added the prescriptive savings estimates for each of the drain water heat recovery measures, hot water pipe insulation, programmable thermostats, and CFLs. Solar hot water heaters and water heater tank insulation were excluded from the prescriptive savings as it was determined that those measures had the potential to be double counted. Within the 25 sampled projects, NMR found instances of double counting for both solar hot water heaters (two instances) and water heater tank insulation (one instance).³⁰ The impacts of CFLs could be modeled in HOT2000, but NMR found that each of the 25 projects sampled had modeled the base loads as “default.” In other words, the impacts of CFLs had not been calculated using HOT2000. For this reason, NMR added the prescriptive savings of CFLs to the per EnerGuide point savings estimates. In 2009, NMR recommended using a savings value of 41 kWh per CFL as this value was consistent with other DSM Administrator programs. The tracking database calculated CFL savings using a value of 43 kWh per CFL—we adjusted this to 41 kWh per CFL for the impact analysis. As previously mentioned, we also adjusted the annual savings value for programmable thermostats from 643 kWh to 63 kWh. This was a more conservative estimate than the program’s current savings value and was also consistent with the evaluated savings value applied to the EnerGuide for Existing Houses program.³¹ Table 3-9 compares the prescriptive savings estimates applied in the program’s tracking database to the estimates applied for our impact analysis.

³⁰ Within our sample of 25 projects, we found two instances of double counting for solar hot water heaters and one instance for water heater tank insulation.

³¹ Programmable thermostats have a strong behavioral component, making a conservative estimate more appropriate.

Table 3-9: Comparison of Electricity Savings (kWh)—Prescriptive Measures

	CFL Fixtures	Thermostat	DWHR 30% to 41.9% efficient	DWHR 42% efficient or greater	Pipe Wrap Insulation	Tank Wrap Insulation	Solar DHW
Tracked	43	643	820	1,026	74	399	2,080
Evaluated	41	63	820	1,026	74	n/a	n/a

Table 3-10 shows a detailed comparison of the tracked and evaluated program savings. Overall, NMR estimates that the 260 homes that participated in the new houses program in 2010 saved a total of 1,321 MWh at the meter. The program's tracking database estimated total savings at 1,702 MWh at the meter—29% higher than the evaluated savings.

Table 3-10: Comparison of Detailed Tracking and Evaluated Savings Estimates

	Number of Projects	Tracking Savings Estimate (MWh)		Evaluated Savings Estimate (MWh)	
		Meter	Generator	Meter	Generator
EnerGuide rating	260	1,504	1,682	1,232	1,378
CFLs	148	77	86	73	828282
Programmable thermostat	57	96	108	9	11
DWHR 30% to 41.9% efficient	1	0.8	0.9	0.8	0.9
DWHR 42% or more efficient	5	5	6	5	6
Pipe wrap insulation	6	0.4	0.5	0.4	0.5
Tank wrap insulation	12	5	5	--	--
Solar DHW	7	15	16	--	--
Total savings	260	1,702	1,905	1,321	1,478

As of January 17, 2011, the 2010 new houses program had a total of 260 participants resulting in an estimated 1,321 MWh of gross savings at the meter and 1,478 MWh at the generator.

Initial demand estimates for the new houses program were calculated by obtaining the ratio of all the residential target peak demand savings to target energy savings from the 2009 DSM targets per the Nova Scotia Utility and Review Board (UARB) Approved Settlement Agreement. Based on an energy-to-demand ratio of 6.8, we developed initial demand savings estimates of 197 kW. In order to verify whether or not this approach was accurate, we compared a sample of program homes to the baseline homes in the REM/Rate software. Using the updated baseline home, this analysis resulted in an energy-to-demand ratio of 7.5, validating the program's value of 6.8. While these values were similar, NMR's REM/Rate analysis did not include ETS units—the program's primary demand saving measure. In order to account for these units, we used the estimated demand savings for ETS units from the tracking database to develop savings of 1,380 kW. We added our initial demand savings estimates, based on the energy-to-demand ratio, to our ETS demand savings estimates and developed total demand savings of 1,574 kW at the meter and 1,761 kW at the generator. (Table 3-11)

Table 3-11: Gross Savings³²

Total Savings	Evaluated Impact Savings Estimate	
	Meter	Generator
Total Savings (MWh)	1,321	1,478
Demand Savings (kW)	1,574	1,761

3.5 REM/Rate Validation of HOT2000

In the final segment of our analysis, we compared the calculated savings for a sample of program homes using both the HOT2000 software and REM/Rate software. The objective of this analysis was to assess whether or not HOT2000, the software that was used to model program savings, was accurate in estimating such savings.

We selected REM/Rate as our comparison software due its widespread use in the United States.³³ REM/Rate is a well established residential energy analysis software that is used by the Environmental Protection Agency (EPA) for its ENERGY STAR Homes program. REM/Rate can also be used to comply with the performance path of the International Energy Conservation Code (IECC).

³² According to the tracking database, the DSM Administrator spent \$281,455.20 on the 260 projects that went through the new houses program in 2010. The 2010 program manual specifies that the DSM Administrator had a budget of \$2,070,000 in 2010.

³³ <http://www.archenergy.com/products/remrate>

3.5.1 Comparison of Savings

The NMR team recreated a sample of ten participating projects and each of the baseline homes in the REM/Rate software. The ten projects were selected based on a mix of characteristics such as EnerGuide rating, home size, foundation type, and heating system type. We subtracted the annual electricity consumption of each project from the annual electricity consumption of each baseline home to calculate the program savings. Table 3-12 shows the average savings for all ten participating projects. Calculating savings using the updated baseline home resulted in a 5% difference in savings between HOT2000 and REM/Rate, while calculating savings using the code upgrade baseline resulted in an 8% difference in savings between the two software programs. When calculating savings, these results showed relatively small differences between HOT2000 and REM/Rate, suggesting that HOT2000 can be used to accurately calculate program savings.

Table 3-12: Average Savings: HOT2000 vs. REM/Rate

	HOT2000		REM/Rate	
	Updated Baseline	Code Upgrade Baseline	Updated Baseline	Code Upgrade Baseline
Baseline energy consumption (kWh)	33,740	26,605	35,638	28,799
Average project consumption (kWh)	24,986		27,310	
Average Savings (kWh)	8,753	1,619	8,328	1,489

3.5.2 Model Differences

While the savings calculated using both HOT2000 and REM/Rate were similar, there were inherent differences in the two software packages. On average, the total annual energy consumption of the ten program projects sampled was 9% higher in REM/Rate than in HOT2000. This was primarily due to three factors:

- 1) REM/Rate models duct leakage, while HOT2000 does not. Six out of the 10 program projects we sampled were modeled with ducts. Duct leakage composed an average of 8% of the annual energy consumption in these homes.³⁴
- 2) Extracting the raw characteristics of windows from HOT2000 was not possible. That is, the only data available for windows was the type, size, and effective R-values and SHGC values (post HOT2000 internal calculations). Due to this, we modeled the homes to reflect the size and types of windows that the HOT2000 files specified, but the effective R-values and SHGC values often varied. In fact, the SHGC values were significantly

³⁴ We applied the REM/Rate default as a duct leakage value for homes modeled with ducts. The REM/Rate default for duct leakage assumes that systems with ducts in unconditioned space operate at 80% efficiency, while systems with ducts in conditioned space operate at 88% efficiency.

lower in REM/Rate, decreasing the solar gain of the model and increasing the heating consumption.³⁵

- 3) REM/Rate adjusts the estimated electricity consumption of lights and appliances based on the size of the home while HOT2000 does not. HOT2000 assumes the same electricity consumption for lights and appliances regardless of the size of the home, resulting in what appeared to be inaccurate consumption estimates for these measures in larger and smaller homes.³⁶

Many of the other differences between the models were likely due to the fact that NMR was extracting data from HOT2000 files to create the REM/Rate models as on-site information was not available in order to model the homes from scratch. Because NMR did not physically visit these homes or have site plans to reference, certain aspects of the models, such as the shape of the home and size of the home may have been slightly inaccurate. Other factors that may have led to differences in the models include differing weather data, different water heating assumptions, and different internal calculations.³⁷

3.6 Heat Pumps

NMR conducted an analysis in the HOT2000 software to determine the impact of adding a heat pump to a code upgrade baseline home that met the Nova Scotia building code requirement of an EnerGuide rating of 80. This analysis revealed that adding an air source heat pump would increase the EnerGuide rating from 80 to 84, and adding a ground source heat pump would increase the EnerGuide rating from 80 to 85.³⁸ Thus, any new home builder in Nova Scotia who planned to install a heat pump would want to participate in the NH program and qualify for incentives for achieving an EnerGuide rating of 83 or higher. A further analysis of the 2010 program tracking database revealed that three out of five 2010 participants who had achieved an EnerGuide rating of 83 or higher had installed a heat pump. This suggests that for many new home builders, participation in the NH program may in fact have been largely driven by an interest in receiving incentives for installing a heat pump.

³⁵ Nearly all of the windows were double paned vinyl windows with low emissivity and argon insulating gas in between the panes. REM/Rate provides a default input for these types of windows that we used in our REM/Rate models.

³⁶ NMR used the default values for lights and appliances in our REM/Rate models. These values are variable based on the size of the home.

³⁷ All of the homes modeled in REM/Rate were modeled with the climate data of Shearwater, NS.

³⁸ Note, this analysis was done assuming that the baseline home with an EnerGuide rating of 80 had electric baseboard heating. Modeling the addition of a heat pump to a home with a central heating system or different envelope characteristics may influence a difference in pre and post EnerGuide ratings that those discussed here.

3.7 Free-ridership

In order to determine the extent of free-ridership, respondents were asked a series of questions related to their plans to pursue program measures before participating in the program, as well as the influence and importance of the program on their decisions to install program measures. The free-ridership questions were divided into three general categories: program influence, stated intent, and screening/cross-check questions. (Table 3-13, Table 3-14, and Table 3-15) Unless otherwise noted, all of the respondents were asked every question.

The following tables list the questions for builders. The questions for homeowners were essentially the same and, thus, were not presented again.

Table 3-13: Builder NH Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide New Houses Program. If you had not participated in the EnerGuide New Houses Program...			
FR2a.	Would you have postponed building this house by more than one year?	Yes No Don't know	0% 50% 25%
FR2c.	The final energy efficiency level of this house would have been lower if you had not participated in the program	Yes No Don't know	See (FR2ci) 50% 25%
FR2ci.	[If yes: Would you have built the house to achieve a (i. Slightly, ii. Somewhat, iii. Significantly) lower level of energy efficiency?]	Slightly Somewhat Significantly Don't know	25% 25% 0% 25%
FR2b.	The final energy efficiency level of the house would have been the same or higher if you had not participated in the program	Yes No Don't know	50% 25% 25%
NH Stated Intent Score = average of FR2a, FR2c+ci, and FR2b.			

Table 3-14: Builder NH Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following elements in your decision to build your home to achieve an EnerGuide Rating of [FROM FILE]? Please give your answer on a scale of 1 to 5, where 1 indicates that ‘the program had no influence at all on your decision to improve the energy efficiency of your home’ and 5 indicates ‘that the program was ‘extremely influential to your decision to improve the energy efficiency of your home.’ How influential was / were the:			
FR4a.	Program Incentives	1	50%
FR4b.	Information or advice provided by the program	2	37.5%
FR4c.	Feedback received from review of home plans	3	25%
FR4d.	The EnerGuide label and designation itself	4	12.5%
		5	0%
		0 (DK)	25%
Program Influence Score = maximum of FR4a, FR4b, FR4c, or FR4d.			

Table 3-15: Builder NH Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Rate
Screening			
FR1.	BEFORE you talked with anyone about the EnerGuide for New Houses program did you have specific plans to build houses that achieve a level of energy efficiency similar to the level required to earn an EnerGuide Rating of 80 or higher?	Yes No Don't know Refused	N/A
Budget Check			
FR3.	If you had not received this incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades incorporated into this home including the incentives?	Yes No Don't know Refused	N/A

Based on their responses to these questions, NMR divided respondents into three distinct groups:

- Full free-riders – Those participants who would have installed the same energy efficiency measures in the absence of the program.
- Non-free-riders – Those participants who would not have installed any of the energy efficient measures within one year of program participation.
- Partial free-riders – Those participants who would have installed measures within one year of program participation, but in smaller quantities or of lesser efficiency.

3.7.1 Full Free-riders

Respondents were identified as full free-riders, if they simultaneously met three criteria:

- They stated that they had had specific plans to build houses that achieved a level of energy efficiency similar to the level required to earn an EnerGuide Rating of 80 or higher:

FR1 = YES (see Table 3-15)

AND

- They said that their budget could have accommodated the full cost of the energy efficient upgrades incorporated into this home including the incentives:

FR3 = 1 (see Table 3-15)

AND

- They said that, within one year, the final energy efficiency level of the house would have been the same or higher if they had not participated in the program:

FR2a = 1 and FR2b = 1 (see Table 3-13)

Among the four builders who responded to the survey, three were classified as full (100%) free-riders. Sixteen of the 43 homeowners in the 2010 sample were full free-riders.

3.7.2 Non-Free-riders

Respondents were identified as non-free-riders if they simultaneously met the following three criteria:

- Before they had talked with anyone about the EnerGuide for New Houses program, they had not had specific plans to build houses that achieved a level of energy efficiency similar to the level required to earn an EnerGuide Rating of 80 or higher:

FR1 = NO (see Table 3-15)

AND

- They said at least one program element had been ‘extremely’ influential to their decision to improve the energy efficiency of their home:

Maximum value of FR4a, FR4b, FR4c, FR4d = 5 (see Table 3-14)

AND

- They indicated they would have postponed beyond one year and would have built the house to achieve a significantly lower level of energy efficiency:

Free-rider rate for FR2a and FR2ci = 0% (see Table 3-13)

Among the four builders, none were classified as non-free-riders (0%). None of the homeowners in the 2010 sample were classified as non-free-riders.

3.7.3 Partial Free-riders

Respondents not identified as either a full free-rider or a non-free-rider were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The

analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relies on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence, the results are then averaged to determine a final free-ridership rate.

3.7.3.1 Stated Intentions

In order to derive respondents’ intentions, they were asked to consider what actions they would have taken in the absence of the NH program. Respondents were asked four questions as shown in Table 3-13. Based on their answers, each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 25%.

- FR2a = Yes (0%)
- FR2c = Yes; FR2ci = Somewhat (25%)
- FR2b = Yes (50%)

3.7.3.2 Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of three program elements on their decision to improve the energy efficiency of the home on a scale of one to five, where one meant the program had ‘had no influence at all’ on their decision and five meant that the program had been ‘extremely influential’ to their decision to improve the energy efficiency of the home.

3.7.3.3 Impact of Budget

For respondents who had received a stated intentions free-ridership rate of 50%, a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project, no adjustments were made; if they said their budget could not have accommodated the project, their free-rider stated intent score was reduced to 25%.

3.7.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each participant, their free-rider stated intent score was averaged with their program influence free-rider score.

The overall program free-ridership proportion was calculated as an average of all respondents.³⁹ Overall, free-ridership in 2010 was 54%, about the same as in 2009 (55%). (Table 3-16) Free-ridership for homeowners in 2010 was 52%, which was similar to the 2009 homeowner free-ridership of 56%. The 2010 builder sample, which was very small (n= 4), had a 79% free-ridership rate as compared to 54% in 2009. In 2010, with an overall free-ridership rate of 54%, the net-to-gross ratio was 0.46, very similar to the 2009 net-to-gross ratio of 0.45. It is important to note that NMR used two separate methods to calculate free-ridership in 2009 and in 2010 for the NH program.

- In 2009, NMR used a combined multiplicative and arithmetic mean approach and used a series of questions based on the standardized methods outlined by PA Consulting in 2003.⁴⁰
- In 2010, based on the decision of the DSM Administrator's coordinated Free-ridership Symposium (May 2010), NMR completely revised the free-ridership questions included in the 2010 survey and mirrored the free-ridership calculations developed for the Energy Trust of Oregon by Research into Action.

Table 3-16: Free-ridership

	2009*			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	9	22	4	43	47
Free-ridership	54%	56%	55%	79%	52%	54%

* The 2009 free-rider analysis used a different methodology described in the appendix.

3.7.5 Differences by EnerGuide Rating

As of January 2010, Nova Scotia building code required that all new homes have an equivalent minimum EnerGuide rating of 80. Accordingly, for 2010, we conducted a more detailed free-ridership analysis by final EnerGuide rating on the homeowner sample.⁴¹ (Table 3-17) This analysis revealed that homes receiving an EnerGuide rating of less than 83 had higher free-ridership (70%) than those that had received an EnerGuide rating of 83 or higher (26%). This suggests that raising the building code reduced free-ridership.

³⁹ During the phone survey, both home builders and homeowners were asked to limit their responses about their experience to a single specific home built through the program.

⁴⁰ PA (2003) *Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report*. Submitted June 16, 2003.

⁴¹ All four 2010 builders achieved an EG83 rating, so this builder comparison was not done.

Table 3-17: Free-ridership by EnerGuide Rating

	2010		
	Builders	Homeowners	Total
<i>Sample size</i>	4	43	47
All respondents greater than or equal to EG80	79%	52%	54%
Respondents between EG80 and EG83	n/a	70%	70%
Respondents greater than or equal to EG83	79%	26%	34%

3.8 Energy Savings Estimation

Table 3-18 presents the overall program savings, which were adjusted to account for the calculated NH free-ridership value of 54%. When taking into account free-ridership, the 260 participating homes were estimated to have saved a total of 680 MWh of energy and 810 kW of demand at the generator. These overall savings fell short of the program's 2010 energy savings target of 2.0 GWh but exceeded the demand savings target of 640 kW.

Table 3-18: Overall Tracking Savings and Net Impact Savings
Adjusted for Free-Ridership

	Program Targets at the Generator	Tracking Savings Estimate		Evaluated Savings Estimate	
		Meter	Generator	Meter	Generator
Energy (MWh)	2,000	1,702	1,905	608	680
Demand (kW)	640	Na	Na	724	810

4 Process Evaluation

4.1 Methodology

The 2010 process evaluation of the NH program was based on a telephone survey of participating builders and homeowners as well as in-depth interviews with a Delivery Agent and Program Staff.

4.1.1 In-depth Interviews

NMR conducted three in-depth interviews in August of 2010: one with a Delivery Agent, one with a program manager from Nova Scotia Power, and one with a staff member at Conserve Nova Scotia (CNS). In January 2011, NMR executives conducted an interview with the marketing consultant to the DSM programs. The interviews covered topics that included the program delivery process, tracking and reporting, satisfaction with procedures, and suggestions for improvement.

4.1.2 Participant Survey

For 2010, NMR completed a survey of 47 participants including four participating builders and 43 homeowners. The sample of participants was provided by the DSM Administrator from the program tracking database.

The survey included questions about various aspects of program satisfaction, sources of information, reasons for participating, program value, and recommendations for improvement. The interviews took an average of 15 minutes to complete.

4.1.1 Sampling Error

Table 4-1 shows the estimated population, sample size and sampling error for the telephone survey. For the participant survey, the sampling error was $\pm 10.88\%$ at the 90% confidence level.

Table 4-1: Sample Size and Sampling Error

Participants	2009			2010		
	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
	80	23	±14.57%	260	47	±10.88%

4.2 Program Goals and Design

The 2010 NH program was administered by Conserve Nova Scotia (CNS). The DSM Administrator provided rebates to eligible new homeowners who had completed approved electric space heating, electric water heating and lighting upgrades to their houses.

In 2010, CNS contracted with three Delivery Agents to implement the program throughout the province. The three Delivery Agents utilized a total of eight certified Energy Advisors who modeled houses based on the building plans and recommended upgrades that would improve their EnerGuide rating.⁴²

A detailed design evaluation summary was provided to the applicant along with a list of potential energy efficiency upgrade options. Upon completion of construction, the Energy Advisor verified the upgrades that had been completed and notified the homeowners about which rebates that they were eligible to receive.

4.3 Program Communication and Delivery

In the in-depth interview, the Delivery Agent indicated that Nova Scotia Labour & Workforce Development trains building inspectors on the NH program, but the training may not make clear that this program is an alternative to the prescriptive method described in the Nova Scotia building code. He also suggested that if the building community were more familiar with the EnerGuide rating they might be willing to adopt it.

Program Staff indicated that there was confusion about the NH program because many changes had taken place. In particular, Natural Resources Canada (NRCan) stopped support for the EnerGuide for Existing Houses (EEH) program, which made some builders think that support for NH had ended as well. In the fall of 2010, CNS announced that the EnerGuide for New Houses Program was going to be re-launched as PerformancePlus, which required additional education.

Program Staff indicated that service providers had been a little more aggressive in promoting the NH program to try and compensate for the decline in business due to the lack of NRCan rebates in the NH program. Program Staff said that there had been no major issues with Delivery Agents in the NH program.

4.4 Sources of Program Information

The NH survey asked respondents where they had learned about the program. In 2010, two of four builders surveyed had learned about the program from contractors, one had learned about it from the Nova Scotia Power website, and one had learned about it from an unspecified source.⁴³

⁴² By contrast, in 2009 the program had contracted with two delivery agents who utilized a total of 37 energy advisors.

⁴³ Although none of the builders in the 2010 sample mentioned the Nova Scotia Home Builders Association compared to eight mentions in 2009, this was likely a function of the very small sample of builders (4) that cooperated with the 2010 survey.

Slightly over one-fourth of the homeowners (12 of 43) had learned about the program from builders, about one-fifth (9 of 43) had learned about it from a newspaper ad or story, and about one-sixth (7 of 43) had learned about it from a home show. (Table 4-2)

Table 4-2: Sources of Program Information

(Base: Builders, owners; multiple response)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	10	23	4	43	47
Home builder	1	2	3	--	12	12
Newspaper ad or story	--	1	1	--	9	9 ^a
Home show (unspecified)	--	--	--	--	7	7 ^a
Word of mouth (neighbor, friend, co-worker, family member, etc.)	--	3	3	--	4	4
From a contractor	1	--	1	2	1	3
Internet (unspecified)	--	--	--	--	3	3 ^a
Radio advertisement	--	--	--	--	2	2 ^a
Call to NS Power	--	--	--	--	2	2 ^a
Did own research	--	--	--	--	2	2 ^a
Nova Scotia Power website	--	1	1	1	--	1
Nova Scotia Power Bill Insert	--	--	--	--	1	1
Real estate agent	--	--	--	--	1	1
In electrical business	--	--	--	--	1	1
Program Delivery Agent: Nova Scotia Home Builders Association	8	--	8	--	--	-- ^a
R-2000 Manager	1	1	2	--	--	-- ^a
Nova Scotia/Ideal new home show	1	1	2	--	--	-- ^a
Letter (unspecified source)	--	1	1	--	--	--
Nova Scotia government website	--	1	1	--	--	--
Conserve Nova Scotia website	--	1	1	--	--	--
Previous experience building with EnerGuide	--	1	1	--	--	--
Courses and programs (unspecified)	1	--	1	--	--	--
Other (unspecified)	--	--	--	1	--	1
Don't know / refused	--	1	1	--	2	2

^a Significantly different from the 2009 sample at the 90% confidence level.

4.5 Homeowner Involvement in Decision-Making

Homeowners were asked a series of questions regarding their involvement in the decision to participate in the program and the installation of recommended measures in their new houses. In 2010, about one-half of the homeowners surveyed (23 of 43) became involved in the program at the initial planning stage of the homes they were buying and slightly under one-third (13 of 43) became involved after the equipment had been installed. (Table 4-3)

Table 4-3: Stage of Owner Involvement in Home Energy Efficiency Decision
(Base: Owners)

When Owner Became Involved	2009	2010
<i>Sample size</i>	10	43
Initial planning/design stage	5	23
Not involved/bought home after project completion	3	10
After plan finalization, before measure installation	--	6
After measure installation, before Final Review of home	2	3
Don't Know	--	1

The survey asked homeowners who had reported being involved in decision-making since the initial planning stage who had made the decision to participate in the program. As Table 4-4 shows, more than one-half of the homeowners (13 of 23) reported that they had made the decision jointly with the builders and about one-third (8 of 23) reported that they themselves had made the decision to participate in the NH program. In contrast, Program Staff thought that the eventual owners could have been more involved in the decision making process.⁴⁴

Table 4-4: Decision-Maker for Program Participation
(Base: Owners who were involved in the initial planning stage)

Decision Made By	2009	2010
<i>Sample size</i>	5	23
Homeowner	2	8
Builder	3	2
Joint decision (homeowner and builder)	--	13

Two-thirds of the surveyed homeowners (29 of 43) reported being involved in decision-making since the initial planning stage or before the measures had been installed. The survey asked these homeowners who had made the decisions about which measures to install. About two-fifths of these homeowners (12 of 29) reported that they themselves had made these decisions, nearly

⁴⁴ However, the program may have had limits to such early involvement given that some houses are built on speculation.

one-third (9 of 29) reported that it had been a joint decision with the builder, and slightly over one-fourth (8 of 29) said that the builder had made the decision. (Table 4-5)

Table 4-5: Decision-Maker for Measures to Install

(Base: Owners involved in the initial planning stage or before the measures were installed)

Decision Made By	2009	2010
<i>Sample size</i>	5	29
Homeowner*	3	12
Builder	1	8
Joint decision (homeowner and builder)	1	9

* This also includes owners who built their own homes.

4.6 Motivations and Barriers

4.6.1 Participant Perspectives

The survey asked builders and owners about their motivations and barriers to participate in the program. Builders were motivated to participate in the program because they had wanted to find out how energy efficient the new house would be, help homeowners save energy, get rebates for measures that had already been planned, and build houses that would save on energy costs. About one-half of the homeowners (12 of 25) indicated that they had been motivated to participate in the program because they had wanted to save on energy costs.⁴⁵ Two homeowners reported that they had been thinking about or planning to install energy efficient measures in their house anyway and two other homeowners said they had wanted to get rebates for measures that were already in the house. (Table 4-6)

⁴⁵ While none of homeowners in the 2009 survey mentioned wanting to save on energy costs, there were only two respondents in the 2009 homeowner sample.

Table 4-6: Most Important Reason for Participating
 (Base: Builders, owners who made the decision to participate; multiple responses)

Motivations	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	2	15	4	21	25
To have a house that would save on energy costs/bills	--	--	--	1	12	13
To get rebates for measures that were already planning / in the house	--	--	--	1	2	3
Find out how energy efficient the new house would be/to get house evaluated	3	--	3	1	1	2
To help buyer / homeowners save energy—not further specified whether for cost, environment	--	--	--	1	1	2
I was thinking about/planning to get energy efficient measures in my house anyway	--	--	--	--	2	2
To help the environment	--	--	--	--	1	1
I was interested in getting a better, more energy efficient home	--	--	--	--	1	1
Had previously worked with other energy efficiency programs					1	1
Energy efficiency	3	1	4	--	--	--
Already using many components/practices of the program	1	--	1	--	--	--
For expert advice about measures to install or how to make home more energy efficient	1	--	1	--	--	--
Option through R2000	1	--	1	--	--	--
Make house more attractive to potential buyers	-	1	1	--	--	--
Marketing tool	2	--	2	--	--	--

Builders' secondary reasons for participating in NH program were to find out how energy efficient the new houses would be, to save energy, and to help the environment. Four homeowners reported that they had wanted to help save energy and three had wanted to help the environment. (Table 4-7)

Table 4-7: Other Reasons for Participating *

(Base: Builders, owners who made the decision to participate; multiple responses)

Motivations	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	2	15	4	21	25
To help save energy—not further specified whether for cost, environment	--	--	--	1	4	5
To help the environment	--	--	--	1	3	4
To have a house that would save on energy costs/bills	--	--	--	--	2	2
I was interested in getting a better, more energy efficient home	--	--	--	--	2	2
Find out how energy efficient the new house would be/to get house evaluated	3	--	3	2	--	1
Generally interested in energy efficiency and renewable energy	1	--	1	--	1	1
I was thinking about/planning to get energy efficient measures in my house anyway	--	--	--	--	1	1
Comfort in the home	--	--	--	--	2	1
Make houses that reduce energy costs/bills	1	1	2	--	--	--
Get rebates	1	--	1	--	--	--
Make house more attractive to potential buyers	1	--	1	--	--	--
Request by town	--	1	1	--	--	--
Suits goals	1	--	1	--	--	--
No other reasons	7	--	7	1	6	7
Other	--	--	--	--	2	2
Don't Know	--	--	--	--	1	1

Respondents were asked if, prior to participating in the program, they had had any concerns about doing so. In 2010, no builders indicated a concern about participating in the NH program. One homeowner reported that they had been concerned that the measures would cost a lot. (Table 4-8)

Table 4-8: Concerns about the NH Program

(Base: Owners and builders who made the decision to participate in NH)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	2	15	4	21	25
Had concerns about NH prior to participation	1	--	1	--	1	1

4.6.2 Delivery Agent Perspectives

Starting in January 2010, Nova Scotia building code required all new homes to have an equivalent minimum EnerGuide rating of 80. Builders or homeowners had to either have their homes performance tested to show a rating of an EnerGuide 80 or higher or adhere to a set of prescriptive measures provided in the new building code. The Delivery Agent interviewed indicated that builders and owners were motivated to participate in the program because, with the new requirement to achieve a minimum EnerGuide rating of 80, they could relatively easily design a home that achieved an EnerGuide rating of 83. However, the Delivery Agent also stated that some people were put off by the performance-based program as, “It is a little bit hocus-pocus because you can get an EnerGuide 80 a couple of ways.” The Delivery Agent went on to elaborate that because of the varying levels of building knowledge among builders, “The simplicity of the prescriptive measure is appealing to builders.” He stated that, “If the building community were more familiar with the program they might be more willing to adopt it; no one is out there actively working with builders to explain all these things.”

4.6.3 Program Staff Perspectives

Program Staff indicated several motivations and barriers to participation in the NH program.

- NH rebates got the attention of customers, but builders were less motivated by the rebates because the homeowners, not the builders, received the rebates.⁴⁶
- Builders and consumers were confused about the program and thought that it had ended because NRCAN had ceased support for EEH. However, as a result of lost EEH business, service providers were more aggressive in promoting the NH program.

⁴⁶ Homeowners typically receive the rebates. As the Program Manual states, “Rebates will be paid to the first owner of the completed house, unless the homeowner and builder agree in writing to transfer the rebate amounts to the builder to reduce the final cost of the home. To transfer rebates, both the homeowner(s) and the builder must complete and sign the Performance Plus application for the transfer of energy efficiency rebates.”

- The Harmonized Sales Tax (a blending of the provincial and federal sales tax) on new and existing buildings increased from 13% to 15% on July 1st, 2010. New building dropped off slightly because of this as well as a summer lull.

4.7 Benefits of Energy Efficient Homes

Respondents were asked their opinions about whether or not the energy efficiency measures installed through the program had resulted in more comfortable homes. As Table 4-9 shows, all four builders and the majority of homeowners (39 of 43) said they thought the NH homes were more comfortable. All four builders and about two-thirds of the homeowners (28 of 43) thought that the energy efficiency measures installed through the program would result in significantly lower energy bills.

Table 4-9: Impact of Measures on Comfort Level and Energy Bills
(Base: Builders, owners)

Measures Will Increase Home Comfort	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	12	10	22	4	43	47
Yes	10	10	20	4	39	43
No	2	--	2	--	3	3
Don't Know	--	--	--	--	1	1
Measures Will Lower Energy Bills	Builders	Homeowners	Total	Builders	Homeowners	Total
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	12	10	22	4	43	47
Yes	10	7	17	4	28	32
No	1	--	1	--	3	3
Don't know / refused	1	3	4	--	12	12

4.8 Program Incentives and Measure Installation Decision

4.8.1 Recommended Measures Not Installed

The 2010 survey asked respondents to indicate if there were any upgrades recommended in the initial review of the house plans they had decided not to install. As Table 4-10 shows, one of the four builders indicated that there was one recommended upgrade that he had decided not to install. That upgrade was an air source electric heat pump and the respondent could not say why he had decided not to install it. Five homeowners (of 29 who had been involved in decisions regarding program participation) indicated that there was at least one recommendation that they had chosen not to install.⁴⁷ The measures they mentioned included: in-floor heating (2), solar domestic water heater (1), skylights (1), and solar panels (1). When asked to identify the most

⁴⁷ By contrast, in 2009 (in the small sample of four homeowners) none of the homeowners reported recommended measures that they had not installed.

important reason for not installing these measures, these homeowners most frequently indicated that the measures were too expensive (4).⁴⁸

Table 4-10: Decided not to Install Some Recommended Measures
(Base: Builders and owners involved in decisions to participate)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	4	17	4	29	33
No	9	4	13	3	24	27
Yes	4	0	4	1	5	6

4.8.2 Prior Intentions and Program Influence

The survey asked builders and owners about their plans to build houses to EnerGuide ratings. As Table 4-11 shows, all four builders and about one-half of the homeowners (13 of 25) had had plans to build houses to achieve an EnerGuide Rating of 83 or higher before they had talked with anyone about the NH program. By contrast, in 2009, none of the builders and only two of nine owners surveyed indicated that they had had plans to build houses with an EnerGuide rating of 83 or higher. This supports the earlier observation that the raising of the building code had motivated builders and homeowners to build houses above even the minimum energy efficiency requirement.

Three of four builders and over one-half of the homeowners (23 of 43) indicated that their final EnerGuide rating would have been the same or higher without the rebates and technical assistance provided by the program.

⁴⁸ Note that skylights would likely reduce the energy efficiency of the house, and thus the EnerGuide rating, rather than increase it.

Table 4-11: Prior Plans and Program Influence
(Base: Builders and owners involved in decisions to participate)

Intention to build house with EnerGuide rating of 80 or higher	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	9	22	4	43	47
Yes	10	5	15	4	32	36
No	3	4	7	--	11	11
Intention to build house with EnerGuide Rating of 83 or higher						
	Builders*	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	n/a	9	9	4	25	30
Yes	n/a	2	2	4	13	17
No	n/a	--	--	--	9	9
Don't Know	n/a	--	--	--	3	3
Influence- Final EnerGuide rating would have been same, lower, or higher without rebates and technical assistance						
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	9	22	4	43	47
Same/higher	5	6	11	3	23	26
Lower	7	2	9	1	17	18
Don't know	1	1	2	--	3	3

* None of the builders included in the survey had achieved an actual EnerGuide rating of 83 or higher, so their intentions to build to this level of efficiency prior to participating was not recorded in the survey.

The 2010 survey asked respondents about the actions they would have taken in the absence of the NH program. As Table 4-12 shows, none of the builders and few homeowners (5 of 43) indicated that they would have postponed building by more than one year.

Table 4-12: Postpone more than a year
(Base: Builders and owners involved in decisions to participate)

	2010		
	Builders	Homeowners	Total
<i>Sample size</i>	4	43	47
No	4	38	42
Yes	--	5	5

The survey asked participants if their budget could have accommodated the full cost of the energy efficient upgrades incorporated into their home, including the incentives, if they had not received the rebates from the DSM Administrator. As Table 4-13 shows, three of four builders indicated that their budgets could have accommodated the full cost, including the incentives, of the energy efficient upgrades they had incorporated into the participating houses.

About 80% of the homeowners (35 of 43) also said that if they had not received the rebates from the DSM Administrator, their budget could have accommodated the full cost of the energy efficient upgrades incorporated into their homes, including the incentives.

Table 4-13: Budget Could Have Accommodate Full Cost of Energy Efficiency Upgrades
(Base: Builders and owners)

	2010		
	Builders	Homeowners	Total
<i>Sample size</i>	4	43	47
Yes	3	35	38
No	1	5	6
Don't Know	--	3	3

The 2010 survey asked respondents about the influence of various elements of the NH program on their decision to build to the EnerGuide rating. Two out of the four builders and nearly one-half of the homeowners (20 of 43) rated the information and advice they had received from the examination of their building plans as extremely or very influential. One of four builders and two-fifths of the homeowners (19 of 43) rated the rebates and incentives provided by the program as extremely or very influential. Three of four builders and about one-third of homeowners (15 of 43) rated the feedback received from reviews of home plans as extremely or very influential. Two of four builders and about one-half of homeowners (23 of 43) rated the EnerGuide label and designation itself as extremely or very influential. (Table 4-14)

Table 4-14: Rating of Program Elements as Extremely/Very Influential to Decision to Build to EnerGuide Rating*
(Base: All Respondents)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	9	22	4	43	47
Information/advice from energy audit	6	2	8	2	20	22
Incentives/rebates from EnerGuide program	8	4	12	1	19	20
Feedback received from review of home plans	na	na	na	3	15	18
EnerGuide label and designation itself	na	na	na	2	23	25

* Number of respondents giving each program element a rating of “4” or “5” on a scale of 1 to 5 where 5= ‘extremely influential’ and 1 = ‘no influence.’ A detailed breakdown of these data is provided in the appendix. (Table B-1)

4.8.3 Awareness and Influence of Nova Scotia Energy Efficiency Requirements

The survey asked builders about the energy efficiency requirements recently incorporated into the building code in Nova Scotia. All four builders were aware of the changes to the building code in Nova Scotia that incorporated energy efficiency requirements. All of the builders indicated that they had a working knowledge of the energy efficiency requirements of the new code. (Table 4-15)

**Table 4-15: Builder Awareness and Knowledge of
2010 Nova Scotia Building Code Energy Efficiency Requirements**
(Base: Builders)

	Builders
<i>Sample size</i>	4
Aware of new energy efficiency requirements	4
Have working knowledge of energy efficiency requirements	4

The 2010 survey asked builders if, since the adoption of the new building code, they or anyone of their staff received training on energy efficient construction practices. As Table 4-16 shows, two of the four builders indicated that they or their staff had received training on energy efficient construction practices. One builder reported having received training on energy efficient construction practices from the Nova Scotia Home Builders Association; the other builder did not know where they had received their training.

Table 4-16: Training on energy efficient construction practices
(Base: Builders)

Received training on energy efficient construction practices	Builders
<i>Sample size</i>	4
Yes	2
No	2

The 2010 survey asked builders what method they typically used or planned to use to comply with the new building code. Two builders indicated that they typically used or planned to comply with the new building code by using prescriptive measures. One said he used the EnerGuide Rating, and one said that he did not know what method he typically used or planned to use to comply with the new building code. (Table 4-17)

Table 4-17: Builder Methods to Comply With the New Building
(Base: Builders)

Method to comply with the new building code	Builders
<i>Sample size</i>	4
Prescriptive measures	2
EnerGuide Rating	1
R-2000	--
Don't Know	1

Three builders indicated that before the code went into effect, 100 percent of their houses were constructed to meet or exceed the standards now required by the new code. One builder indicated one percent met or exceeded the new standards.

The survey asked builders about the most important changes they had had to make to their building practices in order to comply with the new building code. Only one builder reported having had to make any changes and he indicated that compliance had increased the cost of building houses.

4.9 Value of the Program

The survey asked builders to rate the value of the NH program to their company and to their customers using a scale of one to five, where one was 'little value' and five was 'immense value.' As Table 4-18 shows, in the 2010 survey, three of the four builders said that the program had added high value to their company and their customers. Similar proportions of builders responding to the 2009 survey said that the NH program had added high value to their company and their customers.

Homeowners were also asked to rate the value of the NH program on a scale of one to five, where one was 'little value' and five was 'immense value.' In the 2010 survey, 34 of the 43 homeowners said that the program had added high value; seven gave the program intermediate value ratings and two gave it low value ratings. Similar proportions of homeowners who responded to the 2009 survey gave high value ratings to the NH program.

Table 4-18: Rating of Program as Immense/High Value*
(Base: Builders, owners)

	2009		2010	
	Builders	Homeowners	Builders	Homeowners
<i>Sample size</i>	13	10	4	43
Value to company	8	na	3	na
Value to customers/end-users	10	na	3	na
Value to occupants	na	8	na	34

* Number of respondents giving a rating of “4” or “5” on a scale of 1 to 5 where 5= ‘immense value’ and 1 = ‘little value.’ A detailed breakdown of these data is provided in the appendix. (Table B-2)

4.10 Program Satisfaction

Respondents were asked to rate their satisfaction with various aspects of the NH program using a scale of one to five, where one was ‘very satisfied’ and five was ‘very dissatisfied.’ In 2010, all of the builders and nearly all of the homeowners were satisfied or very satisfied with the program overall. (Table 4-19)

The survey also asked respondents to rate their satisfaction with specific program components. All of the builders were satisfied with most aspects of the program including the first review of house plans, the scheduling and timing of review, the competence of the Energy Advisor, the ease of review process, the report received about the house plan’s current efficiency, the recommendations for energy efficient measures, the final energy audit overall, and overall rebates provided by the program. Of the four builders who responded to the survey, three were satisfied with the projected energy efficiency with measures installed and two were satisfied with the rebates for electric space/water heating measures. Only one of the four builders reported being satisfied with the scheduling and timing of the audit. Most of the homeowners were also satisfied or very satisfied with these specific program components. Three homeowners indicated dissatisfaction with the final audit. One homeowner thought the EnerGuide rating was too low and another said the auditor had lacked interpersonal skills. Four homeowners also indicated dissatisfaction with the overall rebates provided by program. A few other homeowners indicated dissatisfaction with program elements such as the first review, ease of review process, and the report received about house plan’s current efficiency; they did not specify the reasons for their dissatisfaction.

Table 4-19: Respondents Who were Very Satisfied / Satisfied with NH Program*
 (Base: Builders and owners —based on role in planning/involvement)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
<i>Sample size</i>	13	10	23	4	43	47
Program overall	13	10	23	4	41	45
<i>Sample size</i>	13	5	18	4	21	25
First review of house plans, overall	10	3	13	4	18	22
Scheduling and timing of review	11	4	15	4	16	20
Competence of Energy Advisor	12	3	15	4	16	20
Ease of review process	13	4	17	4	16	20
Report received about house plan's current efficiency	11	2	13	4	16	20
<i>Sample size</i>	12	5	17	4	28	32
Final energy audit, overall	12	3	15	4	24	28
Overall rebates provided by program	10	3	13	4	23	27
Recommendations for energy efficient measures	10	2	12	4	22	26
Scheduling and timing of audit	11	3	14	1	23	24
Projected energy efficiency with measures installed	11	3	14	3	19	22
Rebates for electric space/water heating measures	7	2	9	2	19	21

* Number of respondents giving a rating of “1” or “2” on a scale of 1 to 5 where 1=‘very satisfied’ and 5 = ‘very dissatisfied.’ A detailed breakdown of these data is provided in the appendix.

4.11 Program Improvement Recommendations

4.11.1 Participant Perspectives

The NH survey asked a question about energy efficiency upgrades that had not been covered that builders and homeowners would like to have had covered by the program. Two of the four builders and ten of the 43 homeowners said there had been other measures that they had wanted covered by the program. (Table 4-20)

Table 4-20: Desire for Program Coverage of Other Upgrades
(Base: Builders, owners)

	2009			2010		
	Builders	Homeowners	Total	Builders	Homeowners	Total
Sample size	13	10	23	4	43	47
No	12	9	21	2	28	30 ^a
Yes	1	1	2	2	10	12 ^a
Don't know	--	--	--	--	5	5

^a Significantly different from the 2009 sample at the 90% confidence level.

Two of the four builders provided suggestions for additional upgrades they would like to see covered by the program. One indicated that he would like more recommendations on how to achieve a higher EnerGuide rating; the other stated that he would like electric hot water and in-floor heating covered by the program. Nine homeowners mentioned specific items they would like covered by the program. Five homeowners requested more information or higher rebates for solar power, and three requested higher rebates for heat pumps. One homeowner wanted in-floor heating covered and another wanted wind-powered energy covered.

The survey also asked respondents for recommendations for improving the program. As Table 4-21 shows, two of the four builders said that they would like to see increased marketing and advertising; one wanted higher rebates, and another said he would like a faster turnaround on receiving rebates and the EnerGuide ratings.

Three of the 43 homeowners said that they would like to see increased advertising, with one remarking, “Maybe they could advertise a little bit more about it so the general public knew about it. I didn't really know about it until the home builders made me aware of it.”

Three of the homeowners asked for more information during the EnerGuide rating process. One of these homeowners observed:

“Be more informative about certain things: the windows; heat pumps — what kind of heat to put in it— things like that. And it's fairly confusing because you get your federal rebate and provincial rebate. It can get confusing.”

Two homeowners said that they would like higher or more accurate efficiency ratings. Two homeowners wanted a faster certification process and two wanted the DSM Administrator to increase support for NH program.

Overall, in both 2010 and 2009, there was a strong desire for continued rebates, higher rebates, increasing program awareness and greater clarity regarding the program.

Table 4-21: Recommendations for improvement
(Base: Builders, owners; multiple responses)

	2009		2010	
	Builders	Homeowners	Builders	Homeowners
<i>Sample size</i>	13	10	4	43
More marketing/advertising	--	1	2	3
Make process simpler (e.g. consolidate rebate programs)/provide more information	--	3	--	3
Higher or more accurate efficiency ratings	5	--	--	2
Faster certification process	--	--	1	2
Focus more on new than existing houses	--	--	--	2
More information regarding solar power	5	--	--	1
Video on website showing efficient versus inefficient home	--	--	--	1
More knowledgeable people answering the phone	--	--	--	1
More communication with builder	--	--	--	1
Continue program	5	--	--	1
Higher rebates	--	--	1	--
Encourage ratings for all existing homes when they are sold.	5	--	--	--

4.11.2 Program Staff Recommendations

Program Staff offered the following program improvement recommendations:

- Provide more information on HOT2000 and how to track or adjust energy savings. In particular, identify plug load and building envelope measures.
- Carefully consider the potential consequences of raising the minimum rating because, “A lot of the providers said that if we did that everyone who did not install a heat pump would be cut out.”
- Provide an information package to builders so they can provide information to their customers.

4.12 Program Strengths/Weaknesses

4.12.1 Delivery Agent Perspective

The Delivery Agent indicated the following strengths and weaknesses about the program:

Strengths:

- The major accomplishment of the program was the prescriptive measures offered by the DSM Administrator – heat pumps, solar domestic water heating systems, Electric Thermal Storage (ETS), etc.
- The program provided “a way of measuring – a yard stick” that lets homeowners understand the efficiency level of their home.
- An improvement over the 2009 program was that, in 2010, builders could receive rebate payments as well as recover administrative fees if the homeowner transferred those payments to the builder.

Weaknesses:

- While the program provided a way of measuring the energy efficiency of a house, builders did not understand the report very well in terms of how it worked and how it was measured.
- The program required a great deal of administrative support. There were many organizations involved in the program, paperwork increased, and it took time to review the HOT2000 reports.
- Builders and owners were confused about the future of the program.
 - Because NRCan cancelled rebates for the EnerGuide for Existing Houses (EEH) program, there was some confusion as to whether the new housing program was also no longer supported by NRCan.
 - There was no direct information about how, when, or if the program would transfer to Efficiency Nova Scotia Corporation (ENSC).

4.12.2 Program Staff Perspective

Program Staff indicated the following strengths and weaknesses of the program:

Strengths:

- More rebates were available which resulted in higher customer attention to the program. The ductless heat pump measure was added to the program.
- The program builds toward future increases in building code requirements. The program showed that building energy efficient homes was feasible and that was helping to

transform the market and make people more familiar with energy efficiency technologies and approaches.

- Interacting with industry associations is important. Instead of trying to reach 100 customers individually, CNS could reach many customers through one point of contact.

Weaknesses:

- When it came time to finish a project, the builders were occasionally slow on submitting paperwork because there was no monetary incentive for them to do so.⁴⁹
 - The program was in a state of transition over the course of 2010. Because of these changes, builders did not want to engage with CNS/ENSC/NSPI until all the changes had been settled.
 - The NH program is set to end applications to new participants on June 30, 2011. What will come next is undetermined.

⁴⁹ While owners can transfer rebates to builders, the rebates typically go to the homeowners. As a result, builders have little incentive to move quickly on paperwork.

5 Firmographics/Demographics

5.1 Builders

In 2010, all four builders had fewer than 20 full-time employees; two of the builders reported having between five and nine employees. (Table 5-1)

Table 5-1: Full-Time Equivalent Workers

	Builders	
	2009	2010
<i>Sample size</i>	13	4
Fewer than 5	4	1
5 to 9	2	2
10 to 19	4	1
20 to 49	3	-- ^a

^aSignificantly different from the 2009 sample at the 90% confidence level.

In both 2010 and 2009, all of the builders surveyed had independent businesses that were not part of larger companies. (Table 5-2)

Table 5-2: Type of Company

	Builders	
	2009	2010
<i>Sample size</i>	13	4
Independent	13	4
Part of a larger company	--	--

In 2010, three of the four builders had been in the residential homebuilding industry more than 20 years; one builder had been in the industry two years. These builders reported having built between six and twelve new construction residential housing units in Nova Scotia in the past two years (between January 2008 and December 2009). They reported no new residential construction in the past two years outside of Nova Scotia.

5.2 Homeowners

As Table 5-3 shows, more than 80% of homeowners live in detached single-family homes. Note that five of the 2010 homeowners reported living in townhouses or duplex units.

Table 5-3: Type of Residence

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Detached single-family home	8	37
Townhouse or duplex	1	5
Semi-detached house	1	1
Mobile home or house trailer	--	--
Row house (single story apartment building)	--	--
Apartment building, less than 5 stories	--	--
Apartment building, at least 5 stories	--	--

Twenty-four of the 43 homes had three bedrooms, while seven had two bedrooms and three had five or more bedrooms. (Table 5-4)

Table 5-4: Number of Bedrooms

	Owners	
	2009	2010
<i>Sample size</i>	10	43
0	--	---
1	--	--
2	--	7 ^a
3	7	24
4	3	-- ^a
5+	--	3 ^a

^a Significantly different from the 2009 sample at the 90% confidence level.

In 2010, 42 of the 43 respondents in the homeowners sample either owned or were buying their home. (Table 5-5)

Table 5-5: Own/Rent

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Own/buying	10	42
Rent/lease	--	--
Don't Know/Refused	--	1

As would be expected, given that no renters were among the sample of homeowners surveyed, practically all of the homeowners reported paying their own electric bills. (Table 5-6)

Table 5-6: Respondent Pays Home Electric Bill

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Yes	10	42
Don't Know/Refused	--	1

All of the homeowners in the 2010 sample reported living in their homes year-round. (Table 5-7)

Table 5-7: Home Occupancy

	Owners	
	2009	2010
<i>Sample size</i>	10	43
All year	10	42
Seasonal/vacation home	--	--
Don't Know/Refused	--	1

Homeowners in the 2010 sample reported a wide range of household sizes. Most commonly, 19 homeowners reported living in homes with two full-time residents, five homeowners reported living in homes with one full-time resident, and nine homeowners reported living in homes with four full-time residents. (Table 5-8)

Table 5-8: Household Size

Number of Full-Time Residents	Owners	
	2009	2010
<i>Sample size</i>	10	43
1	1	5
2	2	19 ^a
3	3	4
4	3	9
5	1	3
6+	--	2
Don't Know/Refused	--	1

^aSignificantly different from the 2009 sample at the 90% confidence level.

Among the homeowners in the 2010 sample, 19 of 43 were between ages 35 and 44, seven were between ages 45 and 54, and nine between ages 55 and 64. Three homeowners were over 65 years old and four were between ages 25 and 34. (Table 5-9)

Table 5-9: Respondent Age

	Owners	
	2009	2010
<i>Sample size</i>	10	43
18-24	--	--
25-34	2	4
35-44	6	19
45-54	1	7
55-64	1	9
65+	--	3
Refused	--	1

The majority (31 of 43) homeowners in the 2010 sample had earned college or university degrees. (Table 5-10)

Table 5-10: Education Attained

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Less than high school graduation certificate	--	1
High school grad and/or some post secondary	--	8 ^a
Trades certificate or diploma	--	2
College certificate or diploma	2	8
University certificate or diploma	8	23 ^a

^a Significantly different from the 2009 sample at the 90% confidence level.

Two-fifths of homeowners in the 2010 sample (18 of 43) reported annual incomes of \$80,000 or more; fifteen homeowners refused to provide their income information. (Table 5-11)

Table 5-11: Annual Household Income

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Less than \$15,000	--	1
\$15,000-\$24,999	--	--
\$25,000-\$34,999	--	1
\$35,000-\$49,999	--	2
\$50,000-\$69,999	1	2
\$70,000-\$79,999	--	4 ^a
\$80,000 or more	9	18 ^a
Refused	--	15 ^a

^a Significantly different from the 2009 sample at the 90% confidence level.

In both 2010 and 2009, the majority of surveyed homeowners were male. (Table 5-12)

Table 5-12: Gender

	Owners	
	2009	2010
<i>Sample size</i>	10	43
Male	8	27
Female	2	16

Appendix A: Interview Guides

PARTICIPANT QUESTIONNAIRE: NSPI ENH PROGRAM

Draft: July 22, 2010

Hello may I please speak with [INSERT NAME]?

1 Yes [GOTO INTRODUCTION]

2 No [SAY “Perhaps you can help me anyway.” GOTO INTRODUCTION]

INTRODUCTION

Hello, my name is _____, from NMR Group. I am calling on behalf of the EnerGuide for New Houses program from Conserve Nova Scotia and Nova Scotia Power.

1. We understand you participated in the EnerGuide for New Houses 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 EnerGuide program?”]

___Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

3 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 EnerGuide program?”]

___Yes [ASK TO SPEAK TO THEM AND REPEAT INTRODUCTION]

___No [THANK & TERMINATE]

___Refused [THANK AND TERMINATE]

“I’m NOT calling about your electricity bill or selling anything. We would like to learn a bit about your experience with participating in the EnerGuide for New Houses rebate program. Your opinions are very important to us and will help us improve this program and other services for customers. Your responses will be kept strictly confidential.” [IF NEEDED, READ, “The survey should take about 15 minutes.”]

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

[SCHEDULED, IF NECESSARY, FOR: _____]

2.[IF SAMPLE FLAG = BUILD CONTINUE, IF SAMPLE FLAG = OWN SKIP TO Q34]Are you in the business of building and selling homes?

1. Yes
2. No – SKIP TO Q34
8. Don't know – THANK & TERMINATE
9. Refused-- THANK & TERMINATE

3. Have you completed any houses that were built through the EnerGuide for New Houses program? That is, have any of the houses you have built through the program received a final EnerGuide rating?

1. Yes – SKIP TO Q7
2. No
8. Don't know
9. Refused

4. Now thinking about those houses which are currently under construction or will be under construction within the next year–Are you planning on building any of these homes through the EnerGuide New Homes program?

1. Yes
2. No / Not building any houses through program – SKIP TO Q7
8. Don't know – SKIP TO Q7
9. Refused– SKIP TO Q7

5. For any houses that will be built through the EnerGuide for New Houses program, have you had an Energy Advisor review the initial housing plans or designs?
1. Yes
 2. No – SKIP TO Q7
 8. Don't know – SKIP TO Q7
 9. Refused– SKIP TO Q7
6. For the houses built through the EnerGuide for New Houses program, has an Energy Advisor conducted a final audit of the completed houses?
1. Yes
 2. No
 8. Don't know
 9. Refused

Section 1 - How Learned about Program/Reasons for Participating

7. How did you first learn about the EnerGuide for New Houses program? [DO NOT READ. ACCEPT MULTIPLE]
1. (Nova Scotia Power Bill insert)
 2. (A utility other than Nova Scotia Power)
 3. (Nova Scotia Power Website)
 4. (Conserve Nova Scotia Website)
 5. (Natural Resources Canada Website)
 6. (The Internet)
 7. (Nova Scotia Power on-hold message)
 8. (Radio Ad)
 9. (Newspaper Ad or Story)
 10. (Seminar or information session put on by delivery agent)
 11. (Program Delivery Agent--Sustainable Housing and Education Consultants)
 12. (Program Delivery Agent: Nova Scotia Home Builders Association)
 13. (Program Delivery Agent: Trinity Inspection Services)
 14. Program Delivery Agent: Amerispec Home Inspection)
 15. (Energy Advisor: Hawkeye Design and Inspection Services)
 16. (From a contractor)
 17. (Word of mouth -- neighbor, friend, co-worker, family member, etc.)
 18. (Builder/construction trade publication)
 19. (Other) [SPECIFY_____]
 - 88 Don't know
 - 99 Refused

8. Thinking back to when you decided to participate in the EnerGuide for New Houses program. What was the ONE most important reason you were interested in participating in the program? [SAME LIST AS IN Q9 below; ACCEPT ONE RESPONSE. PROBE FOR SPECIFIC REASONS]
9. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE; PROBE FOR SPECIFIC REASONS]
1. (To make house that would save buyers / homeowners on energy costs/bills)
 2. (We were already using many of the components or practices of the EnerGuide program)
 3. (To find out 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 buyer / homeowners save energy—not further specified whether for cost, environment)
 6. (To help the environment)
 7. (To get rebates for measures that we were already planning)
 8. (To market house/make house more attractive for potential buyers)
 9. (We wanted to differentiate ourselves from other builders)
 10. (We were interested in building a better, more energy efficient home)
 11. (We are generally interested in energy efficiency and renewable energy)
 12. (We had previously worked with other energy efficiency programs)
 13. (To meet new building code requirements)
 14. (Other) [SPECIFY_____])
 15. (No other reasons)
- 88 Don't know
- 99 Refused

(IF Q3=1 OR Q5=1, SKIP TO Q2

IF Q3=2, 8 OR 9, ASK Q10 & Q11, AND THEN SKIP TO Q26)

10. You have registered for the EnerGuide for New Houses program but have not yet participated in it. What is the ONE most important reason you have not participated in the program? [SAME LIST AS IN Q11, below; ACCEPT ONE RESPONSE; PROBE FOR SPECIFIC REASONS]

11. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE; PROBE FOR SPECIFIC REASONS]

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 already were 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)
7. (Have not gotten around to it)
8. (Scheduling Energy Advisor / Scheduling Final Audit)
9. (Other) [SPECIFY _____]
10. (No other reasons)
88. Don’t know
99. Refused

(IF Q5=2, 8 OR 9, SKIP TO Q26)

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

1. Yes
2. No
8. (Don’t know)
9. (Refused)

13. [IF Q12 = 1] 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 already were 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)
7. (Would be a hassle/too much paperwork)
8. (Other) [SPECIFY _____]
9. (Don’t know)
10. (Refused)

Section 2 – Satisfaction with program

14. Thinking of your OVERALL experience with the EnerGuide for New Houses Program up to this point, including any services received or energy efficient upgrades installed, how satisfied are you 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
8. (Don't know)
9. (Refused)

15. IF Q14 = 4 or 5] You indicated that you were not satisfied with the program overall. What was the ONE most important reason you were not satisfied with the program overall?
[PROBE FOR SPECIFIC ACCEPT ONE RESPONSE–SAME LIST AS Q16]

16. Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

1. (The review of the plans took too long)
2. (Took too long to receive rebate)
3. (Builder not eligible for rebates; only house buyer)
4. (Took too long to install the measures)
5. (Too much paperwork)
6. (Rebates were too small)
7. (Not enough items covered by program)
8. (Didn't like recommendations)
9. (Didn't like what was installed)
10. (Other) [SPECIFY _____]
11. (No other reasons)
88. Don't know
99. Refused

[IF Q4 = 2, 8 OR 9 SKIP Q17]

17. Now I'm going to ask you about your experience with specific aspects of the EnerGuide Program for New Houses. 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.

(IF Q3=1 OR (Q5=1 AND Q6=1), ASK ALL a thru k.)

(IF Q5=1 AND Q6≠1, ASK ONLY a thru e)

	VS	S	NeitherDissat	V.Dissat	DK/Ref	
a. The First Review of the house plans, overall (This was the review of the house plans evaluating the house’s energy efficiency with recommended measures.)	1	2	3	4	5	9
b. Scheduling and timing of the review	1	2	3	4	5	9
c. Competence and expertise of the Energy Advisor	1	2	3	4	5	9
d. Ease of the review process	1	2	3	4	5	9
e. The report you received about the house plan’s current energy efficiency,	1	2	3	4	5	9
f. recommendations for energy efficient measures	1	2	3	4	5	9
g. the projected energy efficiency with measures installed.	1	2	3	4	5	9
h. The Final Energy Audit Overall (This was the audit of the house's energy efficiency to assess the impact of the energy efficient upgrades that were installed.)	1	2	3	4	5	9
i. Scheduling and timing of the final audit	1	2	3	4	5	9
j. The rebates provided by the program overall	1	2	3	4	5	9
k. The rebates provided by the program for electric space and water heating measures	1	2	3	4	5	9

18. [IF Q17a = 4 or 5; OTHERWISE SKIP TO Q20] You indicated that you were not satisfied with the first review of the house plans. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE. Same list as Q19]

19. Were there any other reasons you were dissatisfied with the energy efficiency review of the house plans? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

1. [Specify] _____
2. No other reasons
8. (Don't know)
9. (Refused)

20. [IF Q17h=4 or 5; OTHERWISE SKIP TO Q1] You indicated you were not satisfied with the final energy audit. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE.]

21. Were there any other reasons you were dissatisfied with the final energy audit? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]

1. [Specify] _____
2. No other reasons
8. (Don't know)
9. (Refused)

INCENT1.[IF Q3 or Q5 = 1] Now I would like you to think back to the first review of the house plans. Were there any upgrades that were recommended in the initial review of the house plans that you decided not to install?

1. Yes
2. No
8. (Don't know)
9. (Refused)

INCENT2. [IF INCENT1 = YES; OTHERWISE SKIP TO FR1] What upgrades were those? [RECORD VERBATIM - ALLOW FOR SIX OPEN END RESPONSES]

1. Air source electric heat pump (ANY HEAT PUMP)
2. Solar domestic water heater (ANY SOLAR WATER HEATER)
3. (OTHER)
8. (Don't know)
9. (REFUSED)

INCENT3. What is the ONE most important reason you decided not to install these recommended measures? [PROBE FOR SPECIFIC REASONS; ACCEPT ONE RESPONSE; SAME LIST AS INCENT4]

INCENT4. Were there any other reasons? [PROBE FOR SPECIFIC REASONS; ACCEPT MULTIPLE]

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. (Rebates not big enough)
7. (Want to install other upgrades that are not covered)
8. (Plan to install in the future)
9. (Other [SPECIFY])
10. (No other reasons)
88. Don't know
99. Refused

Section 4 – Free-ridership

FR1. BEFORE you talked with anyone about the EnerGuide for New Houses program did you have specific plans to build houses that achieve a level of energy efficiency similar to the level required to earn an EnerGuide Rating of 80 or higher?

- 1 Yes
- 2 No
- 8 (Don't know)
- 9 (Refused)

FR2. [IF ENERGUIDE RATING FROM FILE IS 83 OR HIGHER]: The house you built at [ADDRESS FROM FILE] received a final EnerGuide Rating of [READ FROM FILE]. BEFORE you talked with anyone about the EnerGuide for New Houses program did you have specific plans to build this house to achieve a level of energy efficiency similar to the level required to earn an EnerGuide Rating of 83 or higher?

- 1 Yes
- 2 No
- 8 (Don't know)
- 9 (Refused)

Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide New Houses Program. If you had not participated in the EnerGuide New Houses Program... **For FR2a-d 1 = YES, 2 = NO, 9 = Don't know; For FR2c if YES ask FR2ci]**

FR2a. Would you have postponed building this house by more than one year?

What impact, if any, do you think participation in the EnerGuide New Houses program had on the energy efficiency level of this house? Would you say that...

FR2b. The final energy efficiency level of the house would have been the same or higher if you had not participated in the program

FR2c. The final energy efficiency level of this house would have been lower if you had not participated in the program

FR2ci. [If yes: Would you have built the house to achieve a (i. Slightly, ii. Somewhat, iii. Significantly) lower level of energy efficiency?]

FR3. According to our records, you received [\$XX - READ FROM FILE] from Nova Scotia Power as part of the EnerGuide New Houses program. If you had not received this incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades incorporated into this home including the incentives?

1. Yes
2. No
3. (Don't know)

FR4. How influential were the following elements in your decision to build your home to achieve an EnerGuide Rating of [READ FROM FILE]? Please give your answer on a scale of 1 to 5, where 1 indicates that 'the program had no influence at all on your decision to improve the energy efficiency of your home' and 5 indicates 'that the program was 'extremely influential to your decision to improve the energy efficiency of your home.' How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. Program Incentives	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice provided by the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Feedback received from review of home plans	1 no influence	2	3	4	5 extremely influential	9 DK

d. The EnerGuide label and designation itself	1	2	3	4	5	9
	no influence					extremely DK influential

Now I would like to ask you a few questions about the energy efficiency requirements recently incorporated into the building code in Nova Scotia.

FR5. Are you aware of the recent changes to the building code in Nova Scotia that incorporate energy efficiency as a building code requirement?

1. Yes
2. No
3. (don't know)

FR6. Do you have a working knowledge of the energy efficiency requirements of the new code?

1. Yes
2. No
3. (don't know)

FR7. Since adoption of the new building code, have you or anyone of your staff received training on energy efficient construction practices?

1. Yes
2. No
3. (don't know)

FR8. [IF FR7 = YES] Who did you receive this training from? [Record verbatim, record multiple responses]

FR9. What method do you typically use or plan to use to comply with the new building code? [READ OPTIONS]

1. Prescriptive measures
2. EnerGuide Rating
3. R-2000
4. (don't know)

FR10. Before the code went into effect, about what percentage of your houses were constructed to meet or exceed the standards now required by the new code? [Record response 1-100%; 999 = Don't know]

FR11. [IF FR6b < 100%] What are the most important changes you have had to make to your building practices in order comply with the new building code? [DO NOT READ]

1. HVAC
2. Windows
3. Insulation
4. Radiant barrier
5. Lighting
6. Air sealing / infiltration
7. Doors
8. Appliances
9. Water heater
10. Orientation
11. Thermal mass
12. Other – Specify (_____)
13. (Don't know/Refused)

Section 4 - Impact of measures on comfort level, energy bills, and value of the program to builder and customers

(IF Q4=2, 8 OR 9 OR Q6=2, 8 OR 9, SKIP TO Q24

IF Q3=1 OR Q6=1, CONTINUE)

[]

22. Do you think the energy efficiency measures installed through the program have resulted in your building a more comfortable home to live in?

1. Yes
2. No
8. Don't know
9. Refused

23. Do you think the energy efficiency measures installed through the program will result in significantly lower energy bills for your customers?

1. Yes
2. No
8. Don't know
9. Refused

24. Overall how would you rate the value of the EnerGuide for New Houses program to your company? On a scale from one to five, where one is LITTLE VALUE and five is IMMENSE VALUE, how would you rate the overall value of the program? [8 = DK, 9 = REFUSED]

[ENTER VALUE] ____ [RECORD ONE NUMBER NOT A RANGE]

25. Overall how would you rate the value of the EnerGuide for New Houses program to the customers who buy and live in the houses you build? On a scale from one to five, where one is LITTLE VALUE and five is IMMENSE VALUE, how would you rate the overall value of the program to your homebuyers?

[ENTER VALUE] ____ [RECORD ONE NUMBER NOT A RANGE]

Section 6 - Receptivity to upgrades covered by programs, and other possible upgrades

26. 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)
8. (Don't know)
9. (Refused)

27. [IF Q26= 1] Which energy efficiency upgrades would you like to have covered by the program? [PROBE FOR SPECIFIC UPGRADES; ACCEPT MULTIPLE]

Section 7 - Recommendations for program improvements

28. Do you have any recommendations for improving the EnerGuide for New Houses program?

Section 8 - Firmographics

29. Approximately how many full-time equivalent workers are employed by your company/organization?

- 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
- 99 Don't know

30. How many years has your company been in the residential homebuilding industry?
[RECORD #; -7 = Don't know]
31. Approximately, how many new construction residential housing units, not buildings but housing units, did your firm complete in the past two years, that is between January 2008 and December 2009, in Nova Scotia.
32. Approximately, how many new construction residential housing units, not buildings but housing units, did your firm complete in the past two years, that is between January 2008 and December 2009, **outside of** Nova Scotia.
33. Is your company independent, or part of a larger company?
- 1 Independent
 - 2 Part of a larger company
 - 3 Refused
 - 4 Other (_____)
 - 99 Don't know

HOMEOWNER / HOME BUYER QUESTIONS**Section 9 – Screening**

34. 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..

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.
4. You were not involved in any of these decisions or bought the home after it was completed.
8. (Don't know)
9. (Refused)

35. (IF Q34=1): Did you make the decision to participate in the EnerGuide for New Houses program or did the builder of your home make the decision? [DO NOT READ. ACCEPT ONE]

1. (I made the decision / I am the builder)
2. (Home Builder)
3. (Both home builder and I jointly made the decision)
8. (Don't know)
9. (Refused)

36. (IF Q34=1 OR 2): Did you make the decisions regarding the energy efficiency measures to install through the EnerGuide for New Houses program or did the builder of your home make the decision? [DO NOT READ. ACCEPT ONE]

1. (I made the decision / I am the builder)
2. (Home Builder)
3. (Both home builder and I jointly made the decision)
8. (Don't know)
9. (Refused)

Section 10 - How Learned about Program/Reasons for Participating

37. How did you first learn about the EnerGuide for New Houses program? [DO NOT READ. ACCEPT MULTIPLE]

1. (Home Builder)
2. (Nova Scotia Power Bill insert)
3. (A utility other than Nova Scotia Power)
4. (Nova Scotia Power Website)
5. (Conserve Nova Scotia Website)
6. (Natural Resources Canada Website)
7. (The Internet)
8. (Nova Scotia Power on-hold message)
9. (Radio Ad)
10. (Newspaper Ad or Story)
11. (Seminar or information session put on by delivery agent)
12. (Program Delivery Agent--Sustainable Housing and Education Consultants)
13. (Program Delivery Agent: Nova Scotia Home Builders Association)
14. (Energy Advisor: Hawkeye Design and Inspection Services)
15. (From a contractor)
16. (Word of mouth -- neighbor, friend, co-worker, family member, etc.)
17. (Builder/construction trade publication)
18. (Other) [SPECIFY_____]
88. Don't know
98. Refused

IF Q35=1 OR 3, CONTINUE OTHERWISE SKIP TO Q44

38. Now I'm going to ask you to think back to when you decided to participate in the EnerGuide for New Houses program. What was the ONE most important reason you were interested in participating in the program? [SAME LIST AS IN Q39 below] [ACCEPT ONE RESPONSE; PROBE FOR SPECIFIC REASONS]

39. Were there any other reasons? [DO NOT READ. ACCEPT MULTIPLE; 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 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)
11. (Other) [SPECIFY_____])

- 12. (no other reasons)
 - 88. (Don't know)
 - 99. (Refused)
40. Before participating, did you have any concerns about taking part in the program?
- 1. Yes
 - 2. No
 - 8. Don't know
 - 9. Refused
41. [IF Q40 = 1] 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 already were 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)
 - 7. (Other) [SPECIFY _____]

Section 11 – Satisfaction with program

42. Thinking of your OVERALL experience with the EnerGuide for New 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?
- 1. Very satisfied
 - 2. Satisfied
 - 3. Neither satisfied or dissatisfied
 - 4. Dissatisfied
 - 5. Very Dissatisfied
 - 8. Don't know
 - 9. Refused
43. IF Q42 = 4 or 5] You indicated that you were not satisfied with the program overall. What was the ONE most important reason you were not satisfied with the program overall? [PROBE FOR SPECIFIC ACCEPT ONE RESPONSE–SAME LIST AS Q44]

44. Were there any other reasons you were dissatisfied? [PROBE FOR SPECIFIC REASONS.

ACCEPT MULTIPLE]

1. (The review of the plans took too long)
2. (Took too long to receive rebate)
3. (Builder not eligible for rebates; only house buyer)
4. (Took too long to install the measures)
5. (Too much paperwork)
6. (Rebates were too small)
7. (Not enough items covered by program)
8. (Other) [SPECIFY _____]
9. (No other reasons)
88. (Don't know)
98. (Refused)

(IF Q34=3, 4, 8 OR 9, SKIP TO FR12)

45. Now I'm going to ask you about your experience with specific aspects of the EnerGuide Program for New Houses. 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.

(IF Q34=1, ASK ALL a thru k.)

(IF Q34=2, ASK ONLY f thru k)

	DK/Ref	VS	S	Neither	Dissat	V.Dissat
a. The First Review of the house plans, overall (This was the review of the house plans evaluating the house's energy efficiency with recommended measures.)	1	2	3	4	5	9
b. Scheduling and timing of the review	1	2	3	4	5	9
c. Competence and expertise of the Energy Advisor	1	2	3	4	5	9
d. Ease of the review process	1	2	3	4	5	9
e. The report you received about the house plan's current energy efficiency,	1	2	3	4	5	9
f. recommendations for energy efficient measures	1	2	3	4	5	9
g. the projected energy efficiency with measures installed.	1	2	3	4	5	9
h. The Final Energy Audit Overall (This was the audit of the house's energy efficiency to assess the impact of the energy efficient upgrades that were installed.)	1	2	3	4	5	9
i. Scheduling and timing of the final audit	1	2	3	4	5	9

j. The rebates provided by the program overall	1	2	3	4	5	9
k. The rebates provided by the program for electric space and water heating measures	1	2	3	4	5	9

46. [IF Q45a = 4 or 5; OTHERWISE SKIP TO Q48] You indicated that you were not satisfied with the first review of the house plans. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE. Same list as Q47]
47. Were there any other reasons you were dissatisfied with the energy efficiency review of the house plans? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]
1. [Specify] _____
 2. No other reasons
 8. Don't know
 9. Refused
48. [IF Q45h=4 or 5; OTHERWISE SKIP TO INSTRUCTIONS BEFORE Q22] You indicated you were not satisfied with the final energy audit. What was the ONE most important reason you were dissatisfied? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT ONE RESPONSE.]
49. Were there any other reasons you were dissatisfied with the final energy audit? [DO NOT READ. PROBE FOR SPECIFIC REASONS. ACCEPT MULTIPLE]
1. [Specify] _____
 2. (No other reasons)
 8. (Don't know)
 9. (Refused)

Section 13 – Free-ridership

INCENT20. Now I would like you to think back to the first review of the house plans. Were there any measures that were recommended in the initial review of the house plans that you decided not to install?

1. Yes
2. No
8. (Don't know)
9. (Refused)

INCENT21. [IF INCENT20 = YES] What measures were those? [RECORD VERBATIM - ALLOW FOR SIX OPEN END RESPONSES – DO NOT READ]

1. Air source electric heat pump (ANY HEAT PUMP)
2. Solar domestic water heater (ANY SOLAR WATER)
3. (OTHER)
8. (Don't know)
9. (REFUSED)

INCENT23. What is the ONE most important reason you decided not to install these recommended measures? [PROBE FOR SPECIFIC REASONS; ACCEPT ONE RESPONSE; SAME LIST AS INCENT24]

INCENT24. Were there any other reasons? [PROBE FOR SPECIFIC REASONS; ACCEPT MULTIPLE]

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. (Rebates not big enough)
7. (Want to install other upgrades that are not covered)
8. (Plan to install in the future)
9. (Other [SPECIFY])
10. (No other reasons)
88. Don't know
99. Refused

FR12. BEFORE you talked with anyone about the EnerGuide for New Houses program did you have specific plans to build or buy a house with an energy efficiency level similar to what is required to achieve an EnerGuide Rating of 80 or higher?

- 1 Yes
- 2 No
- 8 (Don't know)
- 10 (Refused)

FR13. [IF ENERGUIDE RATING FROM FILE IS 83 OR HIGHER]: The house you built or purchased at [ADDRESS FROM FILE] received a final EnerGuide Rating of [READ FROM FILE]. BEFORE you talked with anyone about the EnerGuide for New Houses

program did you have specific plans to build this house to achieve an energy efficiency level similar to what is required to earn an EnerGuide Rating of 83 or higher?

- 3 Yes
- 4 No
- 8 (Don't know)
- 9 (Refused)

Now I would like to ask you to consider what actions you would have taken in the absence of the EnerGuide New Houses Program. If you had not participated in the EnerGuide New Houses Program,

FR14a. Would you have postponed building or purchasing a newly constructed home by more than one year?

What impact, if any, do you think participation in the EnerGuide New Houses program had on the energy efficiency level of this house? Would you say that...

FR14b. The final energy efficiency level of the house would have been the same or higher if you had not participated in the program

FR14c. The final energy efficiency level of this house would have been lower if you had not participated in the program

FR14ci. [If yes: Would you have built the house to achieve a (i. Slightly, ii. Somewhat, iii. Significantly) lower level of energy efficiency?]

FR15. According to our records, you received [\$XX - READ FROM FILE] from Nova Scotia Power as part of the EnerGuide New Houses program. If you had not received this incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades incorporated into your home including the incentive?

- 1. Yes
- 2. No
- 3. (Don't know)

FR16. How influential were the following elements to your decision to build your home to achieve a high level of energy efficiency, represented by an EnerGuide Rating of [READ FROM FILE]? Please give your answer on a scale of 1 to 5, where 1 indicates that 'the program had no influence at all on your decision to improve the energy efficiency of your home' and 5 indicates 'that the program was 'extremely influential to your decision to improve the energy efficiency of your home.' How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. Program Incentives	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice provided by the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Feedback received from review of home plans	1 no influence	2	3	4	5 extremely influential	9 DK
d. The EnerGuide label and designation itself	1 no influence	2	3	4	5 extremely influential	9 DK

Section 14 - Impact of measures on comfort level and value of the program to customers

50. 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
8. Don't know
9. Refused

51. 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 significantly lower energy bills?

1. Yes
2. No
8. Don't know
9. Refused

52. Overall how would you rate the value of the EnerGuide for New Houses program to you and other occupants of your home? On a scale from one to five, where one is LITTLE VALUE and five is IMMENSE VALUE, how would you rate the overall value of the program to you?

[ENTER VALUE] ____ [RECORD ONE NUMBER NOT A RANGE]

Section 15 - Receptivity to upgrades covered by programs, and other possible upgrades

53. Are there any energy efficiency upgrades that were not covered by the program that you would like to have had covered through the program?

- 3. (Yes)
- 4. (No)
- 8. (Don't know)
- 9. (Refused)

54. [IF Q53 = 1] Which energy efficiency upgrades would you like to have covered by the program? [PROBE FOR SPECIFIC UPGRADES; ACCEPT MULTIPLE]

Section 16 - Recommendations for program improvements

55. Do you have any recommendations for improving the EnerGuide for New Houses program?

Section 17 - Demographic characteristics**[ASK ALL HOME BUYERS]**

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

56. 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)
6. Apartment building that has fewer than five stories
7. Apartment building that has five or more stories
8. Other [SPECIFY: _____]
9. (Don't know/refused)

57. How many bedrooms are in your home? [88=DK; Enter zero for a studio apartment with no bedrooms]

58. Do you own or rent this home?

1. Own/buying
2. Rent/lease
3. Other (Specify_____)

59. Do you pay the electric bills for your home?

1. Yes
2. No
3. (Don't know / refused)

60. Is your home occupied year round, or is it a seasonal home?

1. Year round residence
2. Seasonal / vacation home

7. (Other Specify _____)

8. (DK/RF)

61. 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]

62. What is your age? [DO NOT 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)

63. 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)
- 9 (Refused)

64. Which of the following income categories best describes your total annual household income before taxes in 2008? 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
8. (Refused)

65. [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.]

Staff Interview Guide for EnerGuide New Houses and EnerGuide Existing Houses, August 2010**Date:****Name:****Programs responsible for:****Introduction:****[This interview should take about an hour]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about your role with the program:**

1. What percentage of your time do you spend on [EACH PROGRAM]?
2. What, if any, are the responsibilities of other NSPI staff members for [EACH PROGRAM]?
3. In our preliminary interview you identified the following groups and individuals that you interact with as part of the [program]...
 - a. EnerGuide Existing Homes program
 - i. Donald Dodge at Conserve Nova Scotia
 - ii. Delivery agents
 1. Sustainable Housing and Education Consultants – most work
 2. Clean Nova Scotia – second most work
 3. Ridge Energy – middle of work
 4. ACAP Cape Breton – least work
 5. Amerispec – middle of work
 - b. EnerGuide New Homes program
 - i. Brian Hayes at Conserve Nova Scotia
 - ii. Delivery agents
 1. Sustainable Housing and Education Consultants – 50%

2. Nova Scotia Home Builders' Association – 50%
- c. Low Income REAP
 - i. Kate McDonald at Conserve Nova Scotia
 - ii. Delivery agents
 1. MJM Energy
 2. Clean NS
 3. Trinity Maintenance Solutions
 4. ACAP Cape Breton
 - iii. Low income outreach agent [Katherine Reed]
4. In general, have your interactions with these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
5. Do these programs run year round or do they start and end during the year? What is the period of the program? When did it start? When will it end?
6. What are the 2009 energy savings goals for [PROGRAM(s)]? Do you think you will achieve these goals?
7. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program(s) this year?
 - a. Again at the broadest level, what were the areas that were not so successful?
 - b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?

Theory and Logic Model Review:

EnerGuide New/Existing

Now, turning to the EnerGuide New Homes Program / Now, turning to the EnerGuide Existing Homes Program

8. Does the program have an explicit program theory and logic model?
9. In general, how would you characterize the overall goals of the program—would you say that the program is primarily a Resource Acquisition program, where the focus is on

delaying or displacing new power plant construction through demand reduction? Or would you say the program is primarily a Market Transformation program, where the focus is on changing practices and building adoption, and ultimately effect changes in NS provincial energy standards? Or is it a combination of the two? Why?

10. What are the major components and activities of the program, and what are they intended to accomplish?
 - a. In the short term?
 - b. Intermediate term?
 - c. Long term?
11. What are the key outputs from each activity?
12. Is there any sequence to these activities, outputs, or outcomes? Are there any of these that need to happen before another takes place? Are there any casual relationships between these activities, outputs, and outcomes?
13. How do you expect to measure the extent to which program goals have been accomplished—that is, what are the indicators for the outcomes you expect to achieve? Short-term? Intermediate? Long-term?
 - a. Are there any key indicators or metrics to gauge program effectiveness and success in short-, intermediate-, and long-term?
14. What are the assumptions behind the expectations that the program activities will yield the outputs and outcomes, which in turn will help achieve program goals? Assumptions could include:
 - a. Availability of resources and skill sets to organize and manage the program at NSPI
 - b. Availability of resources and skill sets to organize and implement the program at NSPI and / or implementation contractors
 - c. Level of customer motivation and receptivity to program
 - d. Value and effectiveness of program marketing, outreach, and education materials and activities to motivate customers to consider and participate in the program
 - e. Program features that will help overcome barriers to participation
 - f. Value and benefit of the program to any implementation contractors to motivate them to participate in and promote the program
 - g. Characteristics of target customers that make them the appropriate target for the program
 - h. Customer energy usage and operational characteristics that will result in the achievement of program goals by the implementation of the program measures
 - i. Effectiveness of the measures in helping achieve program goals

15. Who are the key program targets? What do you think are their primary motivations for participating in the program? What are the major barriers to their participation in the program?
16. What has changed about the program since the beginning, and why?

Marketing and Verification:

17. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
18. Overall, how successful has each program been so far? Why / Why not?
19. What do you think is particularly good about program delivery of each program? How could program delivery be improved?
20. Are there any safeguards to prevent free-ridership in the EnerGuide programs? What are they?
21. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?
 - a. What, if any, impact has there been to the technologies covered by [program] due to Conserve Nova Scotia moving away from offering incentives for electric measures?
 - b. Are there gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by NSPI programs or any other programs? What could be done to address those gaps?

TIME PERMITTING: Review of 2008 Recommendations:

22. I am going to review some of the evaluation recommendations from 2008. For each one, please indicate whether the recommendation was considered or adopted? And, if not, why not? [SEE NEXT PAGE FOR RECOMMENDATIONS]

Strengths and Weaknesses / Wrap-up:

23. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
24. Based on your experience with the program(s) so far, what are the most important improvements that still need to be made to the program?
25. Are there any other program issues we have not discussed that you would like to mention?

26. We are planning on conducting interviews with [below] are there any other individuals or groups we should speak to about the program?

Low Income REAP

- a. Kate McDonald – CNS
- b. Katherine Reed – Outreach Agent
- c. Four delivery agents

EnerGuide Existing

- d. Five delivery agents
- e. Energy advisors

EnerGuide New

- f. Two delivery agents
- g. Energy advisors

Thank You

Interview Guide for EnerGuide for New Houses Delivery Agents Primary Contact**Date:****Name:****Organization:****Introduction:****[This interview should take about 30 minutes]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about your role with the program:**

1. Please describe [ORGANIZATION NAME] responsibilities for the EnerGuide for New Houses Program.
2. Tell me about any formal or informal training you've had that helped prepare you for your work in this program. What kinds of certifications do you have? What kind of training, if any, did Conserve Nova Scotia or Nova Scotia Power provide you?
3. What training has been most helpful for your work with the program? What training has been least helpful?
4. Do you feel additional training would be helpful? What kind?
5. What do you see as the main goals of the EnerGuide for New Houses Program?
 - a. Who do you see as the main participants of the EnerGuide for New Houses Program? [PROBE: Builders or Home Buyers?]
6. Does [ORGANIZATION NAME] have specific goals for the 2009 EnerGuide for New Houses program? What are they? [PROBE IF NOT MENTIONED; are there also any energy savings goals? IF NOT MENTIONED; are there also any participant goals?] Do you think you will achieve these goals? Why? Why not?
7. About what percentage of your organization's overall business comes from the program?
 - a. IF 50% OR MORE: Is the amount of work that you receive from the program enough to keep you busy all year, or just at some times of the year? What times are you not busy enough? How does this affect your business?
8. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED: How frequent are you in contact with Jordan Dorey, the program

manager at Nova Scotia Power? What is the nature of these interactions? How frequently are you in contact with Brian Hayes, the program manager at Conserve Nova Scotia? What is the nature of these interactions? Do you have any contacts with Natural Resources Canada, the Federal administrator of the EnerGuide Program? IF YES: How frequently and what is the nature of these interactions?]

- a. FOR SUSTAINABLE HOUSING AND EDUCATION CONSULTANTS: You also serve as a delivery agent for the EnerGuide for Existing Houses program? Are there any efficiencies to be derived from working on both these programs? Organizational / administrative? Logistical, e.g., scheduling audits?
9. How frequently are you in contact with [OTHER DELIVERYAGENT]? What is the nature of these interactions? [PROBE IF NOT MENTIONED:
 - a. We understand that SHEC is a service provider for Nova Scotia Home Builders Association. Is this correct? What activities does SHEC perform for Nova Scotia Home Builders Association? [PROBES: File management, data tracking, auditing services]
 - b. Do you ever work on the same project?
 - c. Do you coordinate marketing plans/materials?
10. What other organizations and individuals, do you interact with for this program? What is the nature of these interactions? How frequently are you in contact with them?
11. In general, have your interactions with all of these groups gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
12. Describe how you are paid for your work on the program. Are the payments timely? How might the reimbursement process be improved?

Program Tracking and Reporting

13. Please describe the tracking and reporting data you provide for the EnerGuide for New Houses Program. In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the EnerGuide for New Houses Program is spent on fulfilling data tracking requirements? [PROBE IF ISSUE IS NOT BROUGHT UP: What tracking and reporting data do you provide specifically regarding electric measures that are rebated by Nova Scotia Power? In what form is this data provided? To whom is it provided? How frequently is it provided? Approximately how much of your organization's effort for the EnerGuide for

New Homes Program is spent on fulfilling data tracking requirements specifically for electric measures rebated by Nova Scotia Power?]

- a. FOR NOVA SCOTIA HOME BUILDERS ASSOCIATION: Why is it that NSHBA does not have a program manager dedicated to the EnerGuide New Houses program? Does not having a program manager affect the program implementation, tracking and reporting process? IF YES: In what ways?
14. In general, how well do you think the program tracking and reporting process is working? Do you believe all the necessary data is being captured and passed on to Conserve Nova Scotia? To Nova Scotia Power? If not, what data should be captured? Do you think the data is being captured and communicated in the most efficient possible way? IF NO: How could the data capture and communication be improved?
15. [IF NOT MENTIONED ABOVE] Do you maintain data on the specific measures implemented at each home, along with measures of specific costs and savings estimates? Is this data in hardcopy or computerized?
16. Are there any improvements you would like to see in the data tracking process that we have not already discussed? If yes, what are they?

Program Delivery Process

17. Please describe the program delivery process, starting with the customer's first contact with you. What is the timing for each step in the delivery process; for example, how long does it take to complete the initial EnerGuide rating, provide information to the customer, make changes to plans, complete construction, receive rebate checks?
18. Are there any factors that inhibit your ability to effectively perform any part of the program delivery process? IF YES: What are they? How can these be addressed? What impact do you think addressing them will have on your effectiveness and on the program overall?
19. What impact, if any, has the entry of Nova Scotia Power into the program had on the program delivery process?
20. Typically, what percent of customers make changes to their building plans after the initial EnerGuide rating? Are there some changes that customers implement more often and others that they implement less often? What are they? Why does this happen? What can be done to encourage customers to implement all of the recommended changes?
21. Do you know if the program has had any impact on the stocking practices of equipment vendors? IF YES: In what way?

22. In general, which parts of the program process do you think work particularly well? Why? Which parts work less well? Why?
23. Do you have any other suggestions for improving the program delivery process?

Builder Issues

24. How aware and knowledgeable are builders in your service territory about the program? How important do you think it is to increase builder awareness levels about the program? What do you think should be done to increase builder awareness messages? What do you think are the key messages to communicate regarding the program?
25. Are builders showing interest in the program? Are there any incentives for builders to participate in the program? IF YES: What are they?
26. Are there any common reasons for non-participation among builders? IF YES: What are they?
27. Do builders ever independently promote the program? IF YES: Can you give an example?

Customer Issues

28. In general, how aware and knowledgeable are consumers in your service territory about the program? How important do you think it is to increase consumer awareness levels about the program? Why do you feel this way? What do you think should be done to increase consumer awareness levels? What do you think are the key messages to communicate regarding the program?
29. How have most of the homeowners you serve found out about the program? What are other ways they have learned of the program?
30. Do you do outreach to identify potential customers? How does this work? Do you have access to adequate materials and information for customer presentations and meetings?
- a. [PROBE IF NOT MENTIONED: Do you engage in any marketing activities to attract potential customers to the program? Who is targeted in your marketing (i.e. Home buyers, Builders)? How do you market to them specifically? Do you have access to adequate materials and information for customer presentations and meetings?]
31. Are there any customer segments who have really low participation in the program? Why?
32. Why do you think most customers participate in the program? What other reasons drive participation?
33. What keeps customers from participating in the program?

34. What impact, if any, has the entry of Nova Scotia Power into the program had on customer awareness and/or response to the program? Has there been any impact on customers of the additional electric measure rebates from Nova Scotia Power?
35. How does the initial EnerGuide rating serve the customers' needs? How often does the information provided confirm what they already know about their building plans? How often does it lead them to consider measures they were unaware of?
36. Have you received any complaints or other signs of customer dissatisfaction with the program? If yes, what was involved? If yes, how frequent is this?
37. How satisfied do you think customers are overall with the program? What feedback have you received from customers once the work on their homes is completed? Do you believe this program provides good value to customers?

Strengths and Weaknesses / Wrap-up:

38. What would you say are the program's greatest strengths? And what would you say are the program's greatest weaknesses? What could be done to address these weaknesses?
39. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
40. Are there any other program issues we have not discussed that you would like to mention?
41. We would also like to complete an in-depth interview with one of the energy advisors who works for [ORGANIZATION]. Can you provide me with contact information for an energy advisor?

Appendix B: Detailed Tables

The following table provides a detailed view of Table 4-14 in the report.

Table B-1: Importance of Program Elements in Achieving Rating
(Base: Builders, owners)

	2009							2010						
		Rating: 5= 'extremely influential' and 1 = 'no influence'							Rating: 5= 'extremely influential' and 1 = 'no influence'					
Builders	<i>n</i>	5	4	3	2	1	DK	<i>n</i>	5	4	3	2	1	DK
Influence- Importance of information/advice from energy audit on EnerGuide rating	13	2	4	6	--	1	--	4	1	1	1	1	--	--
Influence- Importance of incentives/rebates from EnerGuide program	13	4	4	3	--	2	--	4	1	--	--	2	1	--
Feedback received from review of home plans	--	--	--	--	--	--	--	4	2	1	1	--	--	--
The EnerGuide label and designation itself	--	--	--	--	--	--	--	4	2	--	1	--	--	1
Homeowners	<i>n</i>	Rating: 5= 'extremely influential' and 1 = 'no influence'						<i>n</i>	Rating: 5= 'extremely influential' and 1 = 'no influence'					
	<i>n</i>	5	4	3	2	1	DK	<i>n</i>	5	4	3	2	1	DK
Influence- Importance of information/advice from energy audit on EnerGuide rating	9	1	1	3	2	1	1	43	9	11	10	3	8	2
Influence- Importance of incentives/rebates from EnerGuide program	9	2	2	4	1	--	--	43	6	13	7	6	9	2
Feedback received from review of home plans	--	--	--	--	--	--	--	43	6	9	10	6	6	6
The EnerGuide label and designation itself	--	--	--	--	--	--	--	43	12	11	6	6	6	2
Total	<i>n</i>	Rating: 5= 'extremely influential' and 1 = 'no influence'						<i>n</i>	Rating: 5= 'extremely influential' and 1 = 'no influence'					
	<i>n</i>	5	4	3	2	1	DK	<i>n</i>	5	4	3	2	1	DK
Influence- Importance of information/advice from energy audit on EnerGuide rating	22	3	5	9	2	2	1	47	10	12	11	4	8	3
Influence- Importance of incentives/rebates from EnerGuide program	22	6	6	7	1	2	--	47	7	13	7 ^a	8	10	2
Feedback received from review of home plans	--	--	--	--	--	--	--	47	8	10	11	6	6	6
The EnerGuide label and designation itself	--	--	--	--	--	--	--	47	14	11	7	6	6	2

^a Significantly different from the 2009 sample at the 90% confidence level.

The following table provides a detailed view of Table 4-18 in the report.

Table B-2: Value of Program
(Base: Builders, owners)

		2009							2010					
	<i>n</i>	Rating: 5= 'immense value' and 0 = 'little value'						<i>n</i>	Rating: 5= 'immense value' and 0 = 'little value'					
		5	4	3	2	1	Don't know / refused		5	4	3	2	1	Don't know / refused
Builders														
Value to company	13	3	5	4	--	1	--	4	1	2	--	--	--	1
Value to customers/ end-users	13	2	8	2	--	1	--	4	1	2	1	--	--	--
	<i>n</i>	Rating: 5= 'immense value' and 0 = 'little value'						<i>n</i>	Rating: 5= 'immense value' and 0 = 'little value'					
		5	4	3	2	1	Don't know / refused		5	4	3	2	1	Don't know / refused
Homeowners														
Value to occupants	10	3	5	1	--	--	1	43	12	22	7	1	1	--

The following table provides a detailed view of Table 4-19 in the report.

Table B-3: Satisfaction with Program
(Base: Builders and owners —based on role in planning/involvement)

Aspects of Program	Builder / Homeowner	2009							2010						
		n	Rating: 1= 'very satisfied' and 5 = 'very dissatisfied'					Don't know / refused	n	Rating: 1= 'very satisfied' and 5 = 'very dissatisfied'					Don't know / refused
			1	2	3	4	5			1	2	3	4	5	
Program overall	Builders	13	7	6	--	--	--	--	4	1	3	--	--	--	--
	Homeowners	10	5	5	--	--	--	--	43	24	17	1	1	--	--
First review of house plans, overall	Builders	13	8	2	--	3	--	--	4	1	3	--	--	--	--
	Homeowners	5	2	1	1	-	--	1	21	12	6	1	--	1	1
Scheduling and timing of review	Builders	13	7	4	1	1	--	--	4	1	3	--	--	--	--
	Homeowners	5	1	3	--	--	--	1	21	10	6	2	--	1	2
Competence of Energy Advisor	Builders	13	9	3	1	--	--	--	4	2	2	--	--	--	--
	Homeowners	5	2	1	1	--	--	1	21	10	6	1	1	-	3
Ease of review process	Builders	13	8	5	--	--	--	--	4	1	3	--	--	--	--
	Homeowners	5	2	2	--	--	--	1	21	9	7	1	1	1	2
Report received about house plan's current efficiency	Builders	13	6	5	1	1	--	--	4	2	2	--	--	--	--
	Homeowners	5	2	--	1	1	--	1	21	7	9	2	1	1	1
Recommendations for energy efficient measures	Builders	12	4	6	1	--	--	1	4	2	2	--	--	--	--
	Homeowners	5	2	--	1	1	--	1	28	5	17	3	--	1	2
Projected energy efficiency with measures installed	Builders	12	4	7	--	1	--	--	4	1	2	--	--	--	1
	Homeowners	5	2	1	--	1	--	1	28	8	11	2	1	1	5
Final energy audit, overall	Builders	12	4	8	--	--	--	--	4	1	3	--	--	--	--
	Homeowners	5	2	1	1	--	--	1	28	10	14	0	2	1	1
Scheduling and timing of audit	Builders	12	5	6	--	1	--	--	3	1	--	--	--	--	--
	Homeowners	5	1	2	--	--	--	1	28	14	9	1	--	--	4
Overall rebates provided by program	Builders	12	1	9	--	1	1	--	4	2	2	--	--	--	--
	Homeowners	5	1	2	--	--	--	2	28	11	12	--	3	1	1
Rebates for electric space/water heating measures	Builders	12	2	5	1	--	--	4	4	1	1	2	--	--	--
	Homeowners	5	1	1	--	--	--	3	28	4	15	3	1	--	5



Impact and Process Evaluation: Efficient Lighting Products Direct Install Program 2010

February 25, 2011

Final Report

Submitted to:

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1 Executive Summary

This report presents the results of the 2010 process and impact evaluation of the Efficient Lighting Products Direct Install Program (DI) conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation. Throughout the report, the results of the 2008 and 2009 process and impact evaluations of the DI program are presented alongside the 2010 results and contrasted where appropriate.

The process evaluation was based on in-depth interviews with DSM Administrator staff and the implementation contractors, as well as telephone surveys with program participants. All the interview guides and survey instruments were developed by NMR staff.

Impact Evaluation Findings

The DI program continues to perform strongly and customers continue to be happy with the program. In 2010, the DI program's generator-level energy savings were estimated to be 25,233 MWh and the demand savings were estimated to be 5,291 kW. These savings exceeded the 2010 program's energy savings goal of 19,960 MWh, and its demand savings goal of 3,240 kW.¹ (Table 1)

Table 1: 2010 Program Energy and Demand Savings

Savings at Generator	Gross Savings		Net-to-Gross Ratio	Net Savings	
	Energy(MWh)	Peak Demand(kW)		Energy(MWh)	Peak Demand(kW)
CFLs	30,660	6,429	77%	23,608	4,950
LED Exit Lights	1,957	410	83%	1,624	341
Total program	32,617	6,839	77%	25,233	5,291

Findings and Recommendations

Despite changes to the free-ridership calculations from year to year, both the CFL and LED free-ridership rates remained statistically similar among 2008, 2009 and 2010. As in 2009, there were indications in 2010 that customers were beginning to act on their knowledge of CFLs and install them on their own, which could result in increased free-ridership levels for CFLs in the future. In 2010, nearly seven out of ten (69%) respondents said they were aware of the benefits of CFLs. Nearly all of the respondents who were aware of the benefits of CFLs (94%) reported having purchased them previously for their businesses. In addition, based on self-reported socket saturations, four out of five 2010 respondents had at least one CFL installed in their business prior to participating in the DI program and over two out of five (45%) said that 25% or more of their screw-based sockets contained CFLs prior to participating in the DI program. In contrast, only two out of five 2010 respondents said they had had at least one LED exit light

¹ Note that program staff are of the opinion that growth may have peaked in 2010.

installed prior to program participation. Based on these findings, it may be advisable to reconsider the incentives and design of the program. One possible approach might be to require customers to pay for a portion of the cost for the energy efficiency measures offered by the program and to continue to offer installation services for free. Detailed findings and recommendations are provided below.

Customer Awareness, Motivations and Barriers

Finding	Recommendation
DI-F1. While around one out of four respondents in 2008, 2009 and 2010 (23%, 25% and 27%) reported having first learned about the DI program from a phone call from a subcontractor, in 2010, more than one out of five respondents said they had first heard about the DI program from an email (21%), significantly more than in 2008 (1%) or 2009 (<1%). This sharp increase in email awareness demonstrated that email could be an effective method for notifying customers about the program.	DI-R1. The DSM Administrator should consider using email to contact customers for programs like the DI program. Email is a cheap and effective method for informing customers about a program like this.
DI-F2. Customers were motivated to participate in the program primarily because of a financial benefit—79% were motivated by saving on energy costs/bills and 5% were motivated by the program incentive. Note that the program did not offer any monetary incentives, the energy efficient measure as well as the installation were provided for free to the participant.	DI-R2. Continue to promote the financial benefit of program participation to small businesses, emphasizing energy savings.

Customer Awareness, Motivations and Barriers (continued)

Finding	Recommendation
DI-F3. As in 2008 and 2009, the majority of 2010 respondents (97%) reported no prior participation in DSM Administrator run energy efficiency programs.	DI-R3. Since the majority of DI program participants have not participated in an energy efficiency program before, it is crucial that the DI program have a positive impact on participants. Otherwise, participants may be reluctant to participate in other energy efficiency programs in the future. The DSM administrator should consider providing customers with updates, perhaps through email, of the energy and cost savings they are experiencing due to participation in DI program.
DI-F4. In 2010, respondents cited lack of time as the number one barrier to pursuing additional energy efficiency (25%). In addition, two out of five respondents were unable to provide a reason that they had not pursued additional energy efficiency measures. This may indicate that respondents didn't have the time to research energy efficiency and, if they were aware of additional measures, they did not have the time to implement them.	DI-R4. At the time of participant contact, provide additional information or direct participants to other sources of information for identifying other energy efficiency measures they could implement. With the expansion of the SBLS (Small Business Lighting Solutions) program to the entire province, DI installation teams should continue to be prepared to provide region-specific contact information for SBLS delivery agents.
DI-F5. Some respondents cited lack of available financing (18%) as a barrier to implementing additional energy efficiency measures.	DI-R5. Current or future program administrators may want to consider a program to offer financing for additional energy efficiency measures, possibly in collaboration with local banks.

CFLs

Finding	Recommendation
DI-F6. Nearly seven out of ten 2010 respondents (69%) reported that they were aware of the benefits of CFLs; about two out of five (44%) reported that they were aware of the benefits of LED exit lights. Slightly more than one in four respondents (26%) reported having had plans to install CFLs or LEDs prior to participating in the DI program. Additionally, four out of five 2010 respondents said they had had at least one CFL installed in their business prior to participating in the DI program and over two out of five (45%) said that 25% or more of their screw-based sockets had contained CFLs prior to participating in the DI program.	DI-R6. Consider adjusting incentive levels for CFLs. This may, for example, include free installation services, but the businesses would have to pay for the cost of the CFLs. They may be further attracted to the proposition if the Administrator negotiates with the supplier to obtain favorable prices for the CFLs.
DI-F7. According to self-reported data, even after participating in the DI program, there is significant potential among participants to install additional CFLs. While 2010 respondents reported that the DI program had installed CFLs in 50% of their screw-based sockets, they also said that, on average, 20% of their screw-based sockets did not contain CFLs even after participating in the program. In addition, nearly one in five respondents (19%) said that fewer than 50% of their sockets contained CFLs after participating in the program.	DI-R7. The DSM Administrator should make an effort to install CFLs in all (100%) available screw-based sockets when visiting customers the first time.

LEDs

Finding	Recommendation
DI-F8. About two out of five respondents (44%) reported that they had been aware of the benefits of LED exit lights prior to participating in the DI program—similar to 2008 and 2009. Fewer than one in twenty respondents (4%) reported actually having purchased LED exit lights prior to participating in the program. Overall, very few (6%) participants had planned to install LEDs prior to program participation and few (3%) reported having actually installed additional LEDs after participating in the DI program.	DI-R8. Given the unchanged awareness levels and additional installation plans post program of LED exit lights, this program component should continue to be promoted actively.
DI-F9. According to self-reported data, even after participating in the DI program there remains significant potential among participants to install LED exit lights. While 2010 participants reported that 34% of their LED exit signs were retrofitted they also reported, on average, that 30% of their exit signs did not contain LEDs. In addition, nearly three out of ten respondents (27%) said that even after participating in the DI program none of their exit signs contained LEDs.	DI-R9. The DSM Administrator should make an effort to install LEDs in all (100%) of available exit lights when visiting customers the first time.

Satisfaction with the Program

Finding	Recommendation
DI-F10. Practically all of the respondents (97%) were satisfied with the program overall and more than four out of five respondents (85%) were ‘very satisfied.’	DI-R10. The Administrator of the program should continue to offer the DI program.

2 Program Description and Data Tracking

2.1 Program Description

The DI program was first launched in 2008 as a pilot program with an energy savings target of 2,641 MWh. the program was able to greatly exceed initial program goals. In 2009, the DI program energy savings target had a manifold increase to 15,300 MWh—nearly a 500% increase over the 2008 target. For 2010, program goals increased again by nearly 30% to 19,960 MWh. (Table 2-1) The 2010 DI program was originally planned to operate until August 31st, 2010. However, due to the popularity of the program and the availability of CFLs, the program was extended through December 2010. As in 2008 and 2009, the program utilized representatives trained by a subcontractor to retrofit lighting equipment in small businesses across the province. For 2010, 12 teams consisting of two people each, operated in eight regions throughout Nova Scotia (Table 2-2). In addition to the products offered in 2009, the 2010 DI program began offering 15 Watt R30 flood-shaped CFLs. (Table 2-3)

Table 2-1: Energy Goals by Year

Program Year	Goals (MWh)	Evaluated results (MWh)
2008	2,641	7,430
2009	15,300	32,100
2010	19,960	25,233

Table 2-2: Maximum number of Installation Teams

Targeted Community	# of Teams
Halifax Regional Municipality	3
Amherst	2
Annapolis Valley and surrounding area	2
Bridgewater and surrounding area	1
Cape Breton Municipality	1
New Glasgow	1
Truro	1
Yarmouth	1

The number of installation teams was reduced over the course of the year to reflect the saturation of CFLs within the small business sector.

Table 2-3: Types of Lighting Retrofits Offered

Measure Offered	2008	2009	2010
13 watt mini-twister CFL	Yes	Yes	Yes
16 watt mini-twister CFL	Yes	No	No
23 watt mini-twister CFL	No	Yes	Yes
14 watt (R20) flood shaped CFL	No	Yes	Yes
15 watt (R30) flood shaped CFL	No	No	Yes
LED exit light retrofit kit	Yes	Yes	Yes

As in 2008 and 2009, the 2010 DI program worked with local Chambers of Commerce and Business Improvement Areas to help promote the program to small businesses. The majority of customer contacts were done by representatives trained by a subcontractor to visit small businesses and install CFLs and LED exit lights. The program used outbound calling from a subcontractor's call center to contact small businesses before representatives visited sites. However, the success of word-of-mouth marketing in 2008 resulted in a reduced need for outbound calling in 2009 and 2010 and the number of call-center staff was reduced accordingly.

2.1.1 Program Theory

The program theory and logic model was updated to reflect any changes to the program compared to 2009. The program theory and logic model are included below.

Program Background

The Efficient Lighting Products – Direct Install Program for 2010 is both a market transformation and a resource acquisition program. As a market transformation program, the DI program's goal is to shift market adoption of an already widely-used product (CFLs) and a product in the early to middle stages on the market-adoption S-curve (LED exit lights). For CFLs, the DI program seeks to leverage high levels of CFL awareness and usage in the residential sector to close the gap in awareness and usage in the commercial sector.² As a resource acquisition program, the DI program's goals are to replace all possible screw-based incandescent lights with CFLs and non-LED exit lights with LEDs at participating businesses. Given the dual resource acquisition and market transformation goals of the program, it is important to note that, while it may not be possible to assure 100% conversion of every possible socket at every customer site, as long as all program-funded lights are installed in sockets, the resource acquisition goal will be satisfied. Furthermore, progress toward the market transformation goal will be greater the larger the number of customers who have CFLs installed--widening the breadth of customers who are comfortable with the technology and increasing the likelihood that they will install CFLs in any unconverted sockets on their own. Given the relatively low levels of prior knowledge in the small business community about the benefits of CFLs and LED exit lights (66% and 56% respectively)³, it is clear that there still is substantial scope and opportunity for transforming the market.

² NMR (2010) *Impact and Process Evaluation: Efficient Lighting Products Retail Markdown Program 2009*. Submitted February 25th, 2010

³ See Table 4-11.

The DI program's marketing and outreach channels include direct contact through a subcontractor, the program contractor, and partnerships with local business associations such as chambers of commerce and business improvement areas.

Program Activities

- **Obtain local business association support.** Local business associations can be utilized as a channel to promote the DI program to the small business market.
- **Program support for business associations.** DI representatives provide ongoing support to local business associations by attending events and providing information.
- **Obtain program products.** The program administrator will obtain sufficient CFLs and LED exit lights to meet the needs of the program.
- **Representative training.** Representatives receive training on program goals, activities and energy efficiency.
- **Telephone introductions.** Trained program representatives contact business owners and managers by phone. Program representatives explain the program to business owners and managers, reinforce the program message and let them know to expect a visit from a program representative.
- **On-site visits.** Face-to-face contact and engagement with small businesses are key to overcoming skepticism about free product installations. Trained representatives visit small businesses to share program product information with potential participants and obtain approval for installations.
- **Installation.** Trained program representatives install CFLs and LED exit lights at participating businesses.

Program Assumptions

- **Local business association support.** Outreach activities are sufficient to motivate local chambers of commerce and business improvement areas to partner with the program.
- **Telephone outreach.** The telephone calls made by trained representatives generate interest among potential participants.
- **On-site visits.** Sufficient training is provided to representatives that visit customer sites. On-site visits serve as opportunities to educate customers and representatives are able to obtain approval for installations.
- **Skills and Equipment.** Program representatives have the equipment, tools, and skills required to install CFLs and LED exit lights.
- **Installation.** The CFLs purchased through the program are installed in small businesses in Nova Scotia.
- **Availability of CFLs and LEDs.** Program representatives have access to sufficient quantities of CFLs and LEDs to complete installations at participating businesses.
- **Understanding of savings.** Small business owners will realize the money that can be saved from converting to CFLs and LEDs. Lighting is one of the highest expenses for small business owners.

- **Transfer of understanding.** Small business owners will remember the energy and bill savings they realized from participating in the program and consider energy efficient options when making decisions to purchase other energy using equipment.

Program Barriers

- **Liability.** Small businesses may not allow representatives to install lighting due to liability concerns.
- **Perceptions of quality.** Small businesses may be concerned that replacing lighting may result in inferior lighting quality.
- **Light color or temperature.** The products offered by the program may not be the correct color or temperature for specific applications.
- **Local business associations.** Local business associations are important to the success of the DI program. A lack of interest in or knowledge of the program could lead to poor participation by local business associations.
- **Equipment.** In addition to having adequate supplies of CFLs and LED exit lights, program representatives also require tools such as ladders to complete installations.
- **Inaccessibility.** As a resource acquisition program, the DI program seeks to replace all appropriate lamps and exit lights at each site, but some lamps or exit lights may be inaccessible or small business may not allow program staff to replace all appropriate lighting.

Short-Term Outcomes

- **Small businesses are aware of the program.** Customers are made aware of the program through local business associations, program phone calls, on-site visits, and word-of-mouth. Customers also learn about the program through collaborative marketing efforts with other energy efficiency program providers, such as Conserve Nova Scotia.
- **Customers allow DI representatives to install CFLs and LEDs.** After becoming aware of the opportunities offered by the program, customers allow DI program representatives to install qualifying equipment:
 - 13 Watt, 23 Watt, 14 Watt (R20) and 15 Watt (R30) CFLs
 - LED exit lights
- **Energy savings and bill reductions.** Energy savings are achieved when program representatives install equipment at small businesses.

Mid-Term Outcomes

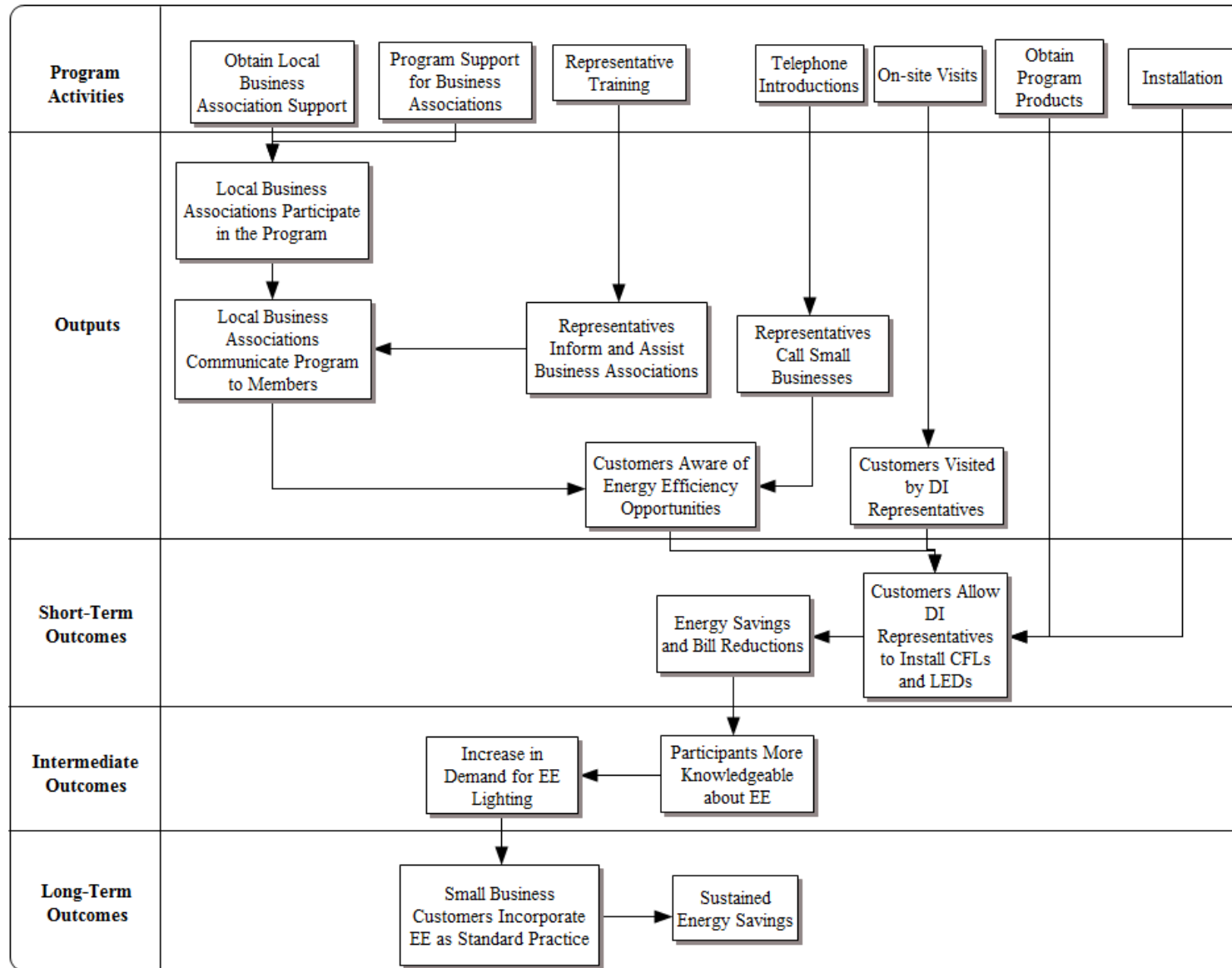
- **Participants are more knowledgeable about energy efficiency.** Participants gain first-hand understanding about the benefits of purchasing energy-efficient equipment.
- **Increase in demand for energy-efficient lighting equipment.** Participants who install energy efficiency lighting recognize its benefits and continue to purchase energy-efficient lighting.

Long-Term Outcomes

- **Small business customers incorporate energy-efficient products and services as standard practices.** Due to first-hand experience, efficient lighting products become standard practice for small business customers. The market is transformed.
- **Sustained energy savings.** Due to increased demand for energy-efficient lighting equipment, sustained energy savings are achieved in the small commercial market.

2.1.2 Program Logic Model

Figure 2-1: Direct Install Program Logic Model



2.2 Program Tracking

The subcontractor tracked installations and also conducted brief satisfaction calls with participants after lights were installed. Data tracked and reported by the subcontractor included the following:

- Business name
- Address
- Business type
- Time of visit
- Date of installation
- Contact name
- Contact phone number
- The name of the team assigned to the job
- Quantity of 13 watt CFLs installed
- Quantity of 23 watt CFLs installed
- Quantity of R20 (14 watt) CFLs installed
- Quantity of R30 (15 watt) CFLs installed
- Quantity of R30 (16 watt) CFLs installed
- Quantity of LED exit lights installed
- Wattage of bulbs replaced with 13 watt CFLs
- Wattage of bulbs replaced with 23 watt CFLs
- Wattage of bulbs replaced with R20 (14 watt) CFLs
- Wattage of bulbs replaced with R30 (15 watt) CFLs
- Wattage of bulbs replaced with R30 (16 watt) CFLs
- Wattage of bulbs replaced with LED exit lights
- Estimated daily hours of use for 13 watt CFLs
- Estimated daily hours of use for 23 watt CFLs
- Estimated daily hours of use for R20 (14 watt) CFLs
- Estimated daily hours of use for R30 (15 watt) CFLs
- Estimated daily hours of use for R30 (16 watt) CFLs
- Estimated total energy savings
- Name of the Installation Team

Note that the program records limited information on exit sign pre-existing conditions.

3 Impact Evaluation

The NMR team evaluated the impacts of the 2010 Efficient Products Direct Install Program through on-site visits to install lighting loggers and the application of engineering algorithms to determine site level savings. We selected a statistical sample of 22 participants for these on-site visits. We reviewed the tracking savings estimates for each site; the site visits confirmed the types and quantities of lighting measures installed and performed metering to capture hours of use. Site level savings estimates included interactive effects, which were calculated and used in a stratified ratio estimation framework to estimate overall program impacts.

3.1 Summary of 2010 Efficient Products Direct Install Savings

This section discusses the savings tracked by the DSM Administrator in the population of the 2010 Efficient Products Direct Install Program. A summary of meter level savings activity is provided in the table below. Total tracked energy savings was just under 41,349 MWh for the program. Table 3-1 shows the number of projects and the number of units of each lighting technology that was installed. A total of 288,827 lighting units were tracked at a total of 5,447 locations.⁴ The vast majority of light bulbs installed were 13W CFL twist style bulbs, which represented over 78% of all units tracked. This population served as the final sample frame for the expansion analysis, although at the time of sampling, the final population had not been established. It is important to note that for sampling purposes Program Administrators and the NMR Team collapsed some sites to reflect all activity performed at the site in instances where installations at a given location occurred over several days.

Table 3-1: Population Summary

Measure	# of Sites	Quantity Installed	Total Gross Savings (MWh)
14W BR20 Flood	217	2,615	322
13W CFL Twist	4,816	225,558	28,699
23W CFL Twist	2,529	38,694	8,293
LED Exit Sign	1,398	10,196	2,584
15W R30 CFL	599	8,720	1,075
16W R30 Dimmable CFL	250	3,044	375
Total		288,827	41,348

At the time of sampling, the program year had approximately 6 weeks left of program activity before year's end. NMR selected a sample that was based upon a stratification scheme for that particular population. Based on the information provided at that time, a total of 4,791 sites were projected to have installed savings in 2010 of 35,169 MWh of energy savings at the meter.

The NMR team used Model-Based Statistical Sampling (MBSS) methodologies to inform the design of the Efficient Products Direct Install impact evaluation sample. MBSS offers methods for stratifying the populations of interest. Typically, the MBSS methodology begins by sorting the sample population by

⁴ Since there were multiple technologies installed at some sites, the number of sites in Table 3-1 exceeds the number of sites that participated in the program in 2010.

magnitude of estimated annual energy savings. Applying this methodology, the NMR team selected a sample that targets $\pm 10\%$ relative precision at the 90% confidence interval for energy savings at the program level. This design assumed an error ratio of 0.30. The final error ratio of the Efficient Lighting Products – Direct Install program in 2008 was 0.27 for the energy estimate.⁵ Thus we assumed an error ratio for 2010 that was slightly more conservative than in 2008. A sample size of 25 was estimated to meet the targeted precision and confidence.

Table 3-2 shows the final sample design. While NMR targeted 25 sites for on-site visits, due to scheduling difficulties and some difficulties physically reaching some sites, we were able to complete visits to 22 sites. The first three columns in the table provide the stratum number, the energy savings cut point used to allocate sites to the strata, and the number of projects in each stratum. The final three columns show the savings in each stratum, the sample visited from each stratum, and the final case weights of the sample.

Table 3-2: Final Sample Design: Savings

Stratum	Max Savings (MWh)	Projects	Total Savings (MWh)	Sample	Case Weight (N/n)
1	4	2,480	5,256	5	496.0
2	7	1,243	6,544	3	414.3
3	11	887	7,643	7	126.7
4	24	601	9,519	3	200.3
5	541	236	12,387	4	59.0

Table 3-3 illustrates the facility types encountered during the on-site visits. The visited sites were fairly diverse in nature, including some retail spaces, offices, and churches. Note that only about one-half of the records in the tracking data included information on the building type. Compared to the available information on the population building type, our sample, although selected for the purpose of estimating energy savings, provides a fairly good representation of those building types.

Table 3-3: Final Sample Design: Building Type

Building Type	Population	Sample
Church	241	3
Charity	57	0
Community Facility	601	3
Multi Res Building	860	5
Restaurant	193	1
Retail	866	5
Seniors Home	66	0
Other	1,036	5
Unknown (blank)	1,528	0
Total	5,448	22

⁵ Note that this did not include lighting logger data.

3.2 Methodology

The participant on-site work consisted of four parts: a review of the lighting installed at the site from the tracking system, a facility walk-through including logger installation/removal, and a savings analysis. Each part is described below. The on-site engineering assessment process culminated in the development of gross estimates of savings for the on-site sample.

3.2.1 Tracking Data Review

The first step in the preparation for each on-site assessment was to review the tracking data on the installed measures. This information was provided in electronic format and included the type of lighting installed, the assumptions and deemed savings values, and some information on exit sign pre-existing conditions. The purpose of this review was to double check the program tracking system values by reproducing them in spreadsheet form and to provide a basis for gathering relevant information on the project in preparation for the on-site activities.

3.2.2 Facility Walk-Through

At the time of the on-site visit, the NMR team auditor performed a walkthrough of the areas of the facility where the measures had been installed. The primary objective of this evaluation was to develop independent estimates of energy and demand savings through verification of installed measure quantities and technologies as well as the installation of loggers when possible. The on-site visits were performed to satisfy the following tasks:

- Identify whether the measures had been installed and were operating as intended including the collection of hours of use by location from the site contact where loggers could not be installed;
- Install time-of-use lighting loggers to gather operating hours of unique schedules identified on-site;
- Collect available information with which to assess interactive effects.

3.2.3 Lighting Loggers

So as to compile the most accurate data regarding operating schedules, lighting loggers were installed in various room types at each facility. Hours-of-use data was made available for lamp usage depending on room function, e.g., washroom, office, hallways, sales floor, living rooms etc. Dent Instrument Time-of-Use (TOU) lighting loggers were installed on-site for approximately 4 weeks.

3.2.4 Lighting Savings Analysis

Standard analysis spreadsheets were employed to calculate demand and energy savings, both with and without interactive effects. These calculations were performed with the pre-retrofit information from the project file and the observed post-retrofit conditions. The methodology for calculating impacts is provided below.

The fundamental calculation of connected demand savings was as follows:

$$\text{Connected kW Savings} = \left(\frac{\text{Quantity}_{\text{Pre}} \times \text{Watts}_{\text{Pre}}}{1,000} \right) - \left(\frac{\text{Quantity}_{\text{Post}} \times \text{Watts}_{\text{Post}}}{1,000} \right)$$

Coincident peak demand impacts were computed by applying coincidence factors to the connected demand reduction as determined from the operating schedule of the lighting at the 5PM-6PM hour for each location according to information provided by each site contact.

$$\text{Peak kW Savings} = (\text{Connected kW Savings}) \times (\text{Coincidence Factor})$$

The fundamental calculation of annual energy savings is provided below. As discussed above, KEMA used site specific lighting logger data gathered during a 4 week metering period to calculate operating hours. To calculate the savings at the generator level, we used a multiplier of 7.1% to account for line losses. This loss factor is associated with the Small General Commercial customer class.

$$\text{kWh Savings} = \left(\frac{\text{Quantity}_{\text{Pre}} \times \text{Watts}_{\text{Pre}} \times \text{Hours}_{\text{Post}}}{1,000} \right) - \left(\frac{\text{Quantity}_{\text{Post}} \times \text{Watts}_{\text{Post}} \times \text{Hours}_{\text{Post}}}{1,000} \right)$$

KEMA calculated the impact of interactive effects for each site. In the context of energy savings analysis, the term “interactive effect” refers to a related change in another devices’ electrical use as influenced by the implementation of an energy conservation measure on a given piece of equipment. The term typically refers to the interaction between a measure installation and the local heating and cooling systems, as reductions in electrical energy use within a conditioned space naturally result in reduced heat gains to the space. In conditioned spaces, this reduced heat gain translates into lower cooling load and higher heating load, which would then be countered by the facility HVAC systems.

Interactive savings estimates were calculated using the measure-specific demand reductions to determine the change in heat gains to the space. The calculation can be complex and fixture-specific or basic and facility-specific, depending upon the objectives of the study. For this evaluation, analysts utilized simplified engineering methods to produce reliable and conservative estimates of HVAC interaction. Fundamentally, interactive effects for lighting retrofits such as were performed for this evaluation are functions of the direct lighting kW reduction, measured coincidence factors, empirical interaction factors, and cooling and heating system efficiencies. The interactive savings quantity is positive for electric cooling interaction and negative for electric heating interaction.

In our streamlined computations, we utilized a number of defaults, including coefficient of performance (COP) by system type for electrical cooling units and an empirical factor regarding the incidence of cooling system operation and lighting operation. For coincident demand savings, we applied a lighting coincidence factor as determined from specific measured logger interval data or from a reported schedule when data was not available. While on-site, evaluators assessed whether areas with lighting were served by cooling systems and the types of systems used in those areas. Nearly all the information on system types was gathered from the site contact as many units were inaccessible and located on roofs.

If a location with lighting installed was determined to be in an electrically cooled space, the interactive cooling kWh savings were calculated as follows:

$$\text{Cooling kWh Energy Savings} = \text{Onsite kWh Savings} \times (\% \text{ of space cooled}) \times \left(\frac{0.23}{\text{Cooling System COP}} \right)$$

Where 0.23 is the energy interaction factor between the lights and cooling system.

The interactive cooling kW was calculated as follows and is included in the kW savings at coincident peak estimate of impacts.

$$\text{Onsite kW Savings} \times (\% \text{ of space cooled}) \times (\% \text{ of lights on at 5 - 6 PM}) \times \left(\frac{0.80}{\text{Cooling System COP}} \right)$$

Where 0.80 is the demand interaction factor between the lights and cooling system at 5-6 PM.

The HVAC System Efficiencies were taken from a lookup table based on the type of HVAC systems employed on-site. Table 3-4 presents the default cooling and heating system efficiencies (COP) used in the interactive calculations. The system COPs in this table represent the operating efficiencies of the HVAC systems as a whole, including losses for fans, pumps, duct leakage, etc. They represent the total system cooling and/or heating energy in kW (BTU per hour divided by 3,413) delivered to the climate controlled spaces divided by the total kW input to the equipment.

Table 3-4: HVAC System Efficiency Lookup Tables

COOLING COP		HEATING COP	
Packaged DX	2.66	A to A Heat Pump	3.37
Window DX	2.34	Electric Strip	1.00
Chiller < 200 T	3.75	Electric Hot Water Boiler	0.95
Chiller > 200 T	4.69	Electric Infrared	1.00
Air to Air Heat Pump	2.93	Electric Steam Boiler	0.80
Water to Air Heat Pump	3.66	Electric Furnace	0.90
Refrigerated Area	2.00	Water to Air Heat Pump	4.21
		Non-Electric	40.0

The following calculations were used in the instances that electric heating occurred in the space equipped with retrofitted lighting. However, the majority of sites were heated via oil or gas fired furnace which had minimal impact on interactive savings.

$$\text{Heating kWh Energy Savings} = \text{Onsite kWh Savings} \times (\% \text{ of space cooled}) \times \left(\frac{0.15}{\text{Heating System COP}} \right)$$

Where 0.15 is the energy interaction factor between the lights and heating system.

The interactive heating kW was calculated as follows and is included in the kW savings at coincident peak estimate of impacts. The formula used to calculate this impact was:

$$\text{Onsite kW Savings} \times (\% \text{ of space cooled}) \times (\% \text{ of lights on at 5 - 6 PM}) \times \left(\frac{0.133}{\text{Heating System COP}} \right)$$

Where 0.133 is the demand interaction factor between lights and heating system at 5-6 PM.

There were two sites that required unique methods to estimate their energy savings. One facility operating as a furniture retailer had received 22 – 13 W CFL's to replace 60 W incandescent bulbs used in display lamps. It was determined that of the 22 lamps originally issued only seven were still at the facility. It was concluded after a discussion with the store owner that 15 portable fixtures had been sold, each equipped with a qualifying 13 W CFL. Residential CFL hours of use⁶ from the 2009 NMR, RLW, GDS study of New England markdown programs was used to credit the program with savings achieved from these 15 lamps after they had entered the residential market.

An apartment complex was included in the sample that was pulled. At this complex, it was not possible to gain access to all areas, including tenant apartments. Through collaboration with the site personnel a total bulb count was estimated. Access was granted to one apartment, and it was confirmed that the 23 units all had a common layout. The installation of lighting loggers was not an option at this facility due to insufficient lead time to inform the tenants. Again, space type specific annual operating hours and coincidence factors from the NMR, RLW, GDS study of New England markdown programs were used to provide the hours input for the savings calculation at this site.

Once all measure level savings were calculated for each sampled site, the NMR team developed an estimate of annual energy savings and peak demand savings. These site level results were then used to develop the program level impacts through the use of stratified ratio estimation techniques. The NMR team used the LRS software to perform this analysis.⁷

Figure 3-1 shows a scatter plot of the estimates of annual gross savings at the meter level for the on-site sample, including interactive effects. A one-to-one reference line is the plotted line on the diagonal, which would represent the line on which all points would fall if the tracking system savings estimates were exactly correct. While there were several sites with evaluated savings that were near their tracking counterparts, there were many that were determined to be lower in our evaluation than in the tracking system. We examined the five largest reductions in savings discrepancies that were below the reference line and colored in red to understand possible causes.

At two of the sites we observed significantly fewer lights than was recorded in the tracking system. At the other three sites, the operating hours were substantially below those assumed by the deemed savings used in the tracking system. Finally, at one of these sampled sites, the majority of new lights were installed in buildings where there was no occupancy and therefore had no hours of operation. Overall, for all sites, we calculated a 77.8% installation rate.

⁶<http://www.env.state.ma.us/dpu/docs/electric/09-64/12409nstrd2ae.pdf>

⁷ See Appendix A.

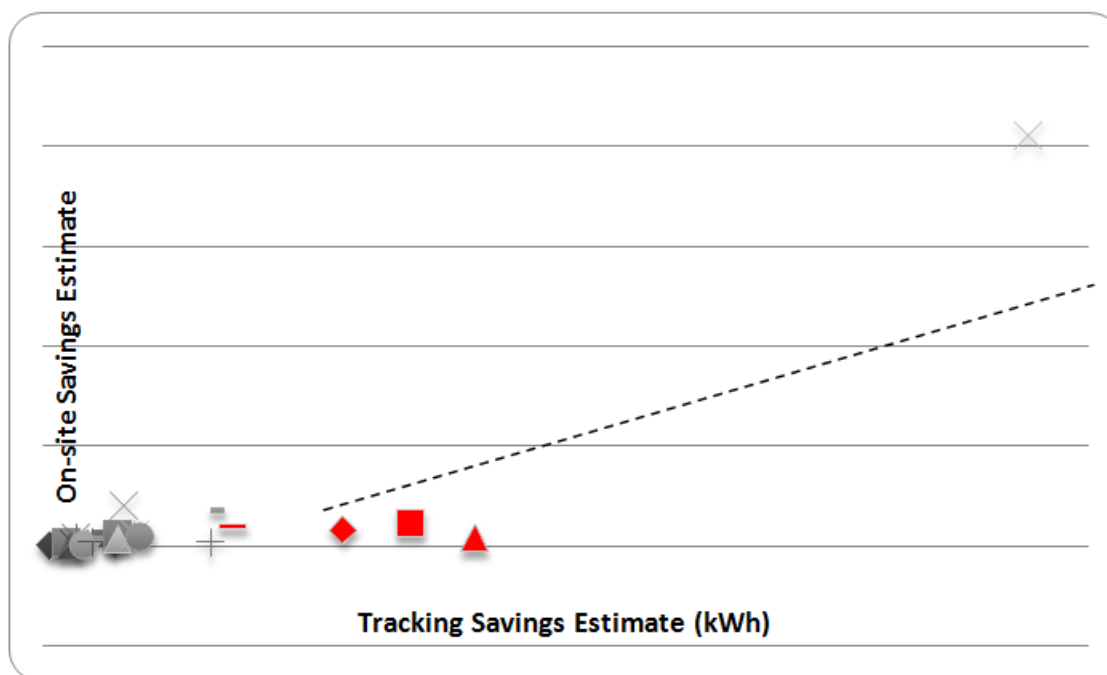
Figure 3-1: Observed On-site versus Tracking System Savings

Table 3-5 shows the installed annual energy and demand savings for the 2010 Efficient Products Direct Install Program. This table is comprised of the original population tracking savings followed by the expanded savings estimates from the on-site observations. As mentioned earlier, these on-site estimates – and therefore our evaluated estimates – were calculated to include interactive effects at the meter level. At the program level, the 2010 installed annual energy savings for the Efficient Products Direct Install Program was determined by the NMR team’s on-site work to be 26,401 MWh at the meter level with a realization rate of 63.8% and 28,846 MWh at the generator level. The peak demand savings were estimated to be 6,048,048 kW at the generator level.

During the course of the evaluation, the NMR team observed discrepancies in installation rates in on-site visits to several locations. This was immediately communicated to Efficiency Nova Scotia. Efficiency Nova Scotia then charged the implementation contractor with determining the extent of the issue and taking steps to rectify it. The implementation contractor generated a report that quantified the changes due to the discrepancies in reported installed quantities by all installer teams as well as quantifying the impact of bulbs left behind and never installed. The implementation contractor performed approximately 600 re-visits as part of this effort. The intention of the report was to provide savings adjustments that could be made to the tracking system that would account for installation rate issues noted as part of the revisits. In total, based on the information from these audits, the implementation vendor estimated that the tracking system had overstated program savings by a total of 2,294 MWh.

If we were to utilize this information to inform an alternative savings estimate, we can assume that the reduction in savings of 2,294 MWh (or 5.5% of tracking) can also be considered an estimate of the installation rate, albeit a rate that is determined through the implementation contractor. Our installation rate was 77.8%. If we were to use an average installation rate between the two sources, such a rate would be 86.2%. Combined with the rest of the adjustments included in our final realization rate of 63.8% (77.8%-63.8%), we can calculate a revised estimate of savings due to the program. Accordingly, Table

3-5 shows our initial savings estimate based on information gathered in the NMR evaluation of 26,400 MWh followed by our final revised estimate of 29,853 MWh based on utilization of the installation rate from the findings in the implementation contractor report.

Table 3-5: 2010 Efficient Products Direct Install Annual Energy and Demand Savings

Initial Savings Estimate	Annual Energy Savings (MWh)	Realization Rate	Coincident Demand Savings (kW)
Tracking Annual Energy Savings (Meter)	41,348	N/A	N/A
Evaluated Annual Energy Savings (Meter)	26,401	63.8%	5,535
Evaluated Annual Savings (Generator) ⁸	28,846	69.8%	6,048
Final Savings Using Program Implementer Adjustment Report for Installation Rate			
Evaluated Annual Energy Savings (Meter)	2929,853	72.2%	6,259
Evaluated Annual Savings (Generator)	3232,617	78.9%	66,839

As part of the analysis, we also reviewed the self-reported hours of operation at the time of our visit and from the on-site loggers. The weighted average of the hours per year from our evaluation was determined to be 2,869. The current hours of use assumption in the deemed savings calculations used in the tracking system was 2,936. Given their convergence and insignificant difference in hours, we believed it was still appropriate to use the current assumed hours of 2,936.

3.3 In-service Rate

The majority of respondents (88%) reported not having removed any of the lighting installed through the program, similar to the responses in 2008 and 2009. Only six respondents reported having removed a total of 97 CFLs from service and one respondent reported removing an unspecified number of CFLs from service, resulting in total in-service rates of 98.4% for CFLs and 100% for LED exit lights. (Table 3-6) Note, however, that the on-site visits revealed a much lower in-service rate of 77.8%.

Table 3-6: In-Service Rate

	2008		2009		2010	
	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs
Removed	60	4	136	0	97	0
Total sample installations	2,772	593	20,906	637	6,237	256
In-service rate	97.8%	99.3%	99.3%	100%	98.4%	100%

⁸ The generator scale factor used is 1.0926

3.4 Spillover

Spillover is additional energy-efficient equipment installed by participants due to program influences and in the absence of direct program assistance. In the 2010 participant survey, respondents were asked about additional purchases of CFLs and LEDs that were similar to those installed through the DI program. More than one out of five 2010 respondents (19%) reported installing additional CFLs after participating in the program, and fewer than one in twenty (3%) reported installing additional LEDs. Among those respondents who had installed additional CFLs, more than one-third (36%) reported installing CFLs of the same efficiency level or higher. Nearly four out of five 2010 respondents (78%) reporting additional installations of CFLs or LEDs said that the DI program had influenced their decision to install these additional lighting upgrades. As Table 3-7 shows, five 2010 respondents reported that the DI program had influenced their decision to install 43 additional CFLs and one respondent said that the DI program had influenced their decision to install 10 additional LED exit lights. The resulting spillover rates were relatively lower for CFLs and relatively higher for LEDs compared to 2008 and 2009, although not significantly so.

Table 3-7: Additional Purchases of CFLs and LEDs

	2008		2009		2010	
	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs
<i>Sample size</i>	70	70	70	70	77	77
Respondents reporting additional installations of the same efficiency or higher	20%	3%	27%	10%	7%	3%
<i>Sample size</i>	14	2	19	7	5	2
Respondents reporting DI influenced their decisions	57%	100%	74%	71%	100%	50%
Total additional installation influenced by program participation	118	6	1,066	9	43	10
Total sample installations	2,772	593	20,906	637	6,237	256
Spillover rate	4%	1%	5%	1%	1%	4%

3.5 Free-ridership

In order to determine the extent of free-ridership, participants were asked a series of questions related to their plans to pursue program measures before participating in the program, as well as the influence and importance of the program on their decisions to install program measures. The free-ridership questions were divided into three general categories: program influence, stated intent, and screening/cross-check questions. (Table 3-8, Table 3-9, and Table 3-10) Except if noted otherwise, all of the respondents were asked every question. Respondents who had not had CFLs or LEDs installed by the program were not asked questions about items not installed.

Table 3-8: CFL Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
If your organization had not participated in the Efficient Lighting Products Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have:			
FR2a.	Postponed installing CFLs by more than one year	Yes No Don't know	0% 50% 25%
FR2b.	Postponed installing LED exit lights by more than one year		
FR2c.	Would not have installed any CFLs		
FR2d.	Would not have installed any LED exit lights		
FR2e.	Would have installed fewer CFLs	Yes No Don't know	See (i) 50% 25%
FR2f.	Would have installed fewer LED exit lights		
FR2ei.	[IF FR2e = YES] Would you have installed slightly, somewhat or significantly fewer CFLs?	Slightly Somewhat Significantly Don't know	25% 25% 0% 25%
FR2fi.	[IF FR2f = YES] Would you have installed slightly, somewhat or significantly fewer LED exit lights?		
FR2g.	Would have installed the same number of CFLs that were installed through the program	Yes No Don't know	50% 25% 25%
FR2h.	Would have installed the same number of LED exit lights that were installed through the program		
CFL Stated Intent Score = average of FR2a, FR2c, FR2e+ei, and FR2g. LED Stated Intent Score = average of FR2b + FR2d + FR2f+fi, and FR2h.			

Table 3-9: CFL Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following to your decision to install [CFLs or/LEDs]? Please give your answer on a scale of 1 to 5, where 1 indicates that the program ‘had no influence at all on your decision to install the energy efficient CFLs’ and 5 indicates that the program was ‘extremely influential to your decision to install the energy efficiency CFLs.’ How influential was/were the:			
FR5a.	Free CFLs	1 2 3 4 5 Don’t know	50% 37.5% 25% 12.5% 0% 25%
FR5b.	Free installation services		
FR5c.	Information received during the initial contact by the program representative		
FR6a.	Free LED exit lights		
FR6b.	Free installation services (LEDs)		
FR6c.	Information received during the initial contact by the program representative		
CFL Program Influence Score = maximum of FR5a, FR5b, or FR5c. LED Program Influence Score = maximum of FR6a, FR6b, or FR6c.			

Table 3-10: CFL Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Rate
Screening			
FR1.	Did your organization have any specific plans to install CFLs or LED exit lights prior to talking with anyone about the Efficient Lighting Products Program	Yes – CFLs and LEDs Yes – just CFLs Yes – just LEDs No plans Don't know	N/A
Budget Check			
FR3.	If Nova Scotia Power had not installed CFLs for free could your budget have accommodated the full cost of installing the CFLs? Not including installation costs, the CFLs would have cost approximately [read: cost from program records] .	Yes No Don't know	N/A
FR4.	If Nova Scotia Power had not installed LED exit lights for free could your budget have accommodated the full cost of installing the LED exit lights? Not including installation costs, the LED exit lights would have cost approximately [read: cost from program records] .		

Based on their responses to these questions, NMR divided respondents into three distinct groups:

- Full free-riders – those participants who would have installed the same energy efficiency measures in the absence of the program.
- Non-free-riders – those participants who would not have installed any of the energy efficient measures within one year of program participation.
- Partial free-riders – those participants who would have installed lighting measures within one year of program participation, but in smaller quantities or of lesser efficiency.

3.5.1 Full Free-riders

Respondents were identified as full free-riders if they simultaneously met three criteria:

- They stated that their organization had had specific pre-existing plans to install CFLs or LEDs prior to talking with anyone about the DI program:

FR1 = YES (see Table 3-10)

AND

- They said that their budget could have accommodated the full cost of installing CFLs or LEDs:
For CFLs, FR3 = 0 (see Table 3-10)
For LEDs, FR4 = 0 (see Table 3-10)

AND

- They said that, in the absence of the DI program, they would have installed the same number of CFLs or LEDs that had been installed through the program within one year:
For CFLs, FR2a = 1 and FR2g = 1 (see Table 3-8)
For LEDs, FR2b = 1 and FR2h = 1 (see Table 3-8)

Among the 75 respondents who, according to program records, had CFLs installed by the DI program, five respondents were classified as full (100%) free-riders. According to program records, these five participants had 610 CFLs installed by the program.

Among the 24 respondents who, according to program records, had LED exit lights installed by the DI program, none were classified as full (100%) free-riders.

3.5.2 Non-Free-riders

Respondents were identified as non-free-riders if they simultaneously met the following three criteria:

- They stated that their organization had no pre-existing plans to install CFLs or LEDs prior to talking with anyone about the DI program:

FR1 = NO (see Table 3-10)

AND

- They said at least one program element had been ‘extremely’ influential to their decision to install CFLs or LEDs:

For CFLs, maximum value of FR5a, FR5b, FR5c = 5 (see Table 3-9)

For LEDs, maximum value of FR6a, FR6b, FR6c = 5 (see Table 3-9)

AND

- They indicated they would have installed no CFLs or LEDs in the absence of the program:

For CFLs, free-rider rate for FR2a, FR2c, and FR2ei = 0% (see Table 3-8)

For LEDs, free-rider rate for FR2b, FR2d, and FR2fi = 0% (see Table 3-8)

Among the 75 respondents who, according to program records, had CFLs installed by the DI program, five respondents were classified as non-free-riders (0%). According to program records, these five participants had 398 CFLs installed by the program.

Among the 24 respondents who, according to program records, had LED exit lights installed by the DI program, only one was classified as a non-free-rider (0%). According to program records, this respondent had 4 LED exit signs installed by the program.

3.5.3 Partial Free-riders

Respondents not identified as either a full free-rider or a non-free-rider were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relies on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence the results are then averaged to determine a final free-ridership rate.

Stated Intentions

In order to derive respondents’ intentions, they were asked to consider what actions they would have taken in the absence of the DI program. Respondents were asked to consider their actions separately for CFLs and LEDs. Respondents were asked four questions as shown in Table 3-8. Based on their responses,

each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 31.25%.

- FR2a = Yes (0%)
- FR2c = No (50%)
- FR2e = Yes; FR2ei = Somewhat (25%)
- FR2g = Yes (50%)

Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of three program elements on their decision to install CFLs or LEDs on a scale of one to five, where one meant the program ‘had no influence at all’ on their decision and five meant that the program had been ‘extremely influential’ to their decision to install energy efficient CFLs or LEDs. Again, respondents were asked to consider CFLs and LEDs separately.

Impact of Budget

For respondents who had received a stated intentions free-ridership rate of 50%, a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project, no adjustments were made; if they said their budget could not have accommodated the project their free-rider stated intent score was reduced to 25%.

3.5.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each participant, their free-rider stated intent score was averaged with their program influence free-rider score.

In order to calculate the final free-ridership rate for the DI program, each participant was assigned a weight based on program records of the number of CFLs or LEDs installed at their business. These calculations were performed separately for CFLs and LEDs. The resulting free-ridership rate for the CFL portion of the DI program in 2010 was 22%. For the LED portion of the program, the free-ridership was 13%⁹. As Table 3-11 shows, the CFL free-ridership rate for the 2010 DI program was higher than in 2008 and 2009, although not significantly so. Similarly, the LED free-ridership level for the 2010 DI program, while relatively lower than in 2009, was statistically similar to both the 2008 and 2009 rates. It is important to note that NMR used three separate methods to calculate free-ridership between 2008 and 2010 for the DI program.

- In 2008, NMR used a multiplicative approach and used a series of questions based on the standardized methods outlined by PA Consulting in 2003.¹⁰

⁹ Note that LED exit light kits cannot be purchased in retail stores.

¹⁰ PA (2003) *Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report*. Submitted June 16, 2003

- In 2009, NMR used a similar approach as in 2008. However, for the 2009 free-ridership calculations, the NMR team adopted the use of an arithmetic mean for two components of the CFL free-ridership as well as a more conservative scoring method for all of the factors in the free-ridership calculations.
- In 2010, based on the decision of the DSM Administrator coordinated Free-ridership Symposium (May 2010), NMR completely revised the free-ridership questions included in the 2010 survey and mirrored the free-ridership calculations developed for the Energy Trust of Oregon by Research into Action.

Table 3-11: Free-ridership

	2008		2009		2010	
	CFLs	LED Exit Lights	CFLs	LED Exit Lights	CFLs	LED Exit Lights
Sample size	61	33	67	38	74	24
Free-ridership rate	14%	12%	16%	23%	22%	13%

3.6 Net-to-Gross Ratio

For the DI program, the net-to-gross ratio was calculated based on spillover and free-ridership. For the 2010 program year, the net-to-gross ratio for the program was 77% for CFLs and 83% for LED Exit Lights. (Table 3-12)

$$\text{Net-to-Gross Ratio} = 1 + (\text{Spillover}) - (\text{Free-ridership})$$

Table 3-12: 2010 Net-to-Gross Ratio

	2010	
	CFLs	LED Exit Lights
Spillover rate	1%	4%
Free-ridership rate	22%	13%
Net-to-Gross ratio	77%	83%

3.7 Energy Savings Estimation

Table 3-13 presents the net installed annual energy and demand savings for the 2010 Efficient Products Direct Install program. The net annual savings were based on the original population tracking savings, the expanded savings estimates from the on-site observations and lighting loggers, the overstated installations adjustment factor based on the program implementer's report, and the net-to-gross ratio derived from the participant survey. According to the tracking database, 94% of program savings were from CFL installations and 6% were from LED Exit Light installations. The net-to-gross ratios for each measure type were applied to the respective evaluated savings divided in the same proportions.

In 2010, the DI program's generator-level energy savings were estimated to be 25,233 MWh and the program's generator-level demand savings were estimated to be 5,291 kW. These savings exceeded the 2010 program's energy savings goal of 19,960 MWh, and its demand savings goal of 3,240 kW. In addition, the 2010 savings exceeded the evaluated energy savings for 2008 and 2009 combined (39,520 MWh), which points to significant growth for the DI program between 2008 and 2010.¹¹

Table 3-13: 2010 DI Program: Estimated Net Energy and Demand Savings

Net Savings at Generator	Energy(MWh)	Peak Demand(kW)
CFLs	23,608	4,950
LED Exit Lights	1,624	341
Total program	25,233	5,291

¹¹ Program staff are of the opinion that growth may have peaked in 2010.

4 Process Evaluation

4.1 Methodology

The 2010 process evaluation of the Direct Install component of the Efficient Lighting Products Program drew upon in-depth interviews conducted with program staff and contractors as well as surveys of program participants. In addition, the 2010 process evaluation findings were compared and contrasted with the results of the 2008 and 2009 process evaluations throughout this report.

4.1.1 In-depth Interviews

NMR staff conducted three in-depth interviews in July, August and November of 2010—one each with the DSM Administrator's program manager, the implementation contractor's project manager and the subcontractor's project manager. The interviews covered a variety of program-related topics including program goals, program theory and delivery.

4.1.2 Participant Survey & Sample Design

NMR completed a total of 77 interviews with 2010 program participants. For the 2009 evaluation, NMR had sought to develop an efficient sample design using Neyman allocation based on stratifying the population by energy savings and number of locations. This approach yielded a sample that had included more participants who had installed larger numbers of CFLs and/or LEDs. However, limited available sample in some of the strata had resulted in a modified sample design that nevertheless had still included more participants who had installed larger numbers of CFLs and/or LEDs. This was important for developing robust impact estimates. In 2010, due to the inclusion of additional impact analysis activities, most notably on-site validation and verification, NMR elected not to utilize a similar Neyman allocation and instead sought to complete interviews with a random sample of program participants. Accordingly, weighted data are shown in the rest of this report for 2009 respondents, unless noted otherwise or if tables report actual counts of respondents. For 2008 and 2010, the data are unweighted in all cases.

4.1.3 CFL and LED Installations

Based on the 2010 survey responses, the DI program installed a total of 6,237 CFLs at the 77 participating businesses surveyed. Respondents in the survey sample installed an average of 81 CFLs and 3 LEDs. By comparison, the participants in the population installed an average of 32 CFLs and 7 LEDs.

Table 4-1: CFLs and LEDs Installed

	2008				2009*				2010			
	Surveyed Participants		All Participants		Surveyed Participants		All Participants		Surveyed Participants		All Participants	
<i>Sample size</i>	70		1,087		70		3,436		77		5,447	
# of CFLs or LED kits installed	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs
0 to 10	44%	79%	45%	83%	29%	76%	25%	92%	16%	92%	36%	81%
11 to 20	14	11	12	9	6	11	16	4	17	3	23	12
21 to 30	7	1	9	3	6	6	13	2	10	3	15	4
31 to 40	4	4	6	2	7	1	8	1	4	1	7	2
41 to 50	6	0	5	1	6	1	7	<1	10	--	5	1
51 to 60	4	1	4	1	3	1	4	<1	6	--	3	<1
61 to 70	6	1	2	1	4	1	3	<1	8	--	1	<1
71 to 80	1	0	2	0	4	1	3	<1	4	1	2	<1
81 to 90	3	0	2	0	3	--	2	<1	3	--	1	--
91 to 100	0	0	2	0	1	--	2	<1	1	--	1	--
100 or more	10	1	11	0	31	1	17	<1	21	--	6	--
Average installed	40	8	41	7	299	9	62	3	81	3	32	7
Maximum installed	450	134	1,175	200	3,921	110	3,921	186	846	76	792	80

* Unweighted data based on program tracking records.

4.1.4 Sampling Error

Table 4-2 shows the estimated population, sample size and sampling error for the 2008, 2009 and 2010 telephone surveys. For each survey, the sampling error was less than 10% at the 90% confidence interval.

Table 4-2: Sample Size and Sampling Error*

	Population Size(N)	Sample Size(n)	Sampling Error at 90% Confidence Interval
2008 Participant survey	934	70	±9.5%
2009 Participant survey	2,213	70	±9.7%
2010 Participant survey	5,447	77	±9.3%

*Population size is based on the number of unique participants.

4.2 Program Goals and Design

The implementation contractor and their subcontractor hired and trained representatives to visit businesses and directly install CFLs and LED exit lights. Services were provided to businesses free of charge. Businesses were contacted by phone and informed about the program before being visited by representatives. The 2010 program was designed to meet a goal of 19,960 MWh of energy savings and 3,240 kW of demand savings by installing as many CFLs and LED exit lights as possible in small commercial businesses throughout Nova Scotia.

As shown previously in Table 4-1, the program installed an average of 32 CFLs and seven LED exit lights at each of 5,447 small businesses throughout Nova Scotia. Three-quarters of participants (74%) received 30 or fewer CFLs and more one-third of participants (36%) received 10 CFLs or less. The majority of participants (81%) received fewer than 11 LEDs. (Table 4-1)

4.3 On-Site Visit Discrepancies

During the on-site visits for the impact evaluation, NMR identified numerous discrepancies between the number of installed bulbs as recorded in the tracking system and the number installations observed on-site. These discrepancies were brought to the attention of the Program Administrator who reviewed them with the implementation vendors. Further investigation by the implementation vendors revealed that these discrepancies stemmed from two sources:

1. Inaccurate reporting of installations by installer teams. One particular installer team was determined to have fabricated business names and over-stated the number of measures they had installed;
2. Installers leaving behind uninstalled bulbs at participating businesses. According to the implementation vendors, uninstalled bulbs were left behind with the assumption that customers would install them on their own. Bulbs were left behind in cases where height constraints prevented the installation team from installing them or customers preferred to install them themselves—primarily in apartment buildings with apartments occupied with tenants.

The DSM Administrator and the implementation vendors took immediate corrective action to address these issues. The installer team that was determined to have fabricated business names and over-stated the

number of measures they installed was removed from the program. In addition, the implementation vendors sought to determine the scope and magnitude of the inaccuracies by conducting a thorough audit of that installation team's jobs as well as the jobs done by the other installation teams. Based on the information from paper audits and 631 site visits, the implementation vendor estimated that the tracking system had overstated program savings by a total of 2,294 MWh; this includes an overstatement of 2,098 MWh for CFL savings and 196 MWh for LED Exit Light savings.

To ensure similar errors do not occur in the future, the implementation vendor re-designed program processes and plans to put into place additional checks for the on-site installation teams. These include bi-weekly audits, customer satisfaction calls to a sample of participants, on-site checks to a sample of participants as well as other procedures to prevent such behavior and discrepancies.

4.4 Sources of Program Awareness

More than one out of four respondents in 2010 (27%) reported having first learned about the DI program from a phone call from a program representative, a similar percentage as in 2008 and 2009. About one-fifth of 2010 respondents (21%) reported having first learned about the DI program through email, significantly more than in 2008 and 2009. Given the large number of participants in 2008 and 2009, it was not surprising that one-quarter (25%) of 2010 participants reported having first learned about the program through general word of mouth (7%) or from another program participant directly (18%). (Table 4-3)

Table 4-3: First Contact¹²

	2008	2009	2010
<i>Sample size</i>	70	70	77
Phone call from program rep	23%	25%	27%
Email	1 [†]	<1 ^{σ†}	21
Another program participant	7 [†]	-- ^{σ†}	18
In-person visit from program rep	14	34 ^{σ†}	8
Word of mouth	9	19 ^{σ†}	7
NSPI presentation	-- [†]	3	5
DSM Administrator staff	30 [†]	11 ^{σ†}	4
Program literature	7	-- ^{σ†}	4
Newspaper	--	5	1
DSM Administrator website	3	<1	--
Chamber of commerce	3	<1	--
Other	0 [†]	<1	4
Don't know	3	2	1

¹² Throughout this report, the symbol 'σ' is used to indicate that results between 2008 and 2009 respondents are significantly different at the 90% confidence level.

The symbol '†' is used to indicate that results between 2008 and 2009 respondents are significantly different from 2010 respondents at the 90% confidence level.

Despite the relatively large number of participants since 2008 (8,594), the DI program continues to serve customers who, by and large, have not participated in a DSM Administrator program in the past. The majority of respondents (97%) reported no prior participation in DSM Administrator run energy efficiency programs, similar to what was reported by respondents in 2008 and 2009. (Table 4-4) Two respondents said they had participated in programs prior to 2010. One respondent reported having participated in the DI program in 2008 and one respondent reported having participated in an unspecified Conserve Nova Scotia program in 2009. (Table 4-5)

Table 4-4: Prior DSM Administrator Program Participation

	2008	2009	2010
<i>Sample size</i>	70	70	77
Previous participation	7%	6%	3%

Table 4-5: Prior Energy Efficiency Programs Reported

Programs	2008	2009	2010
Direct Install Program	--	--	1
Unspecified Conserve Nova Scotia Program	--	--	1
Lighting Program 2006 to 2009	--	5	--
Energy audit before 2001, 2004 & 2005	2	1	--
Hot Water Heater (unknown year)	--	1	--
Thermostat 2006	--	1	--
Training program 2002	1	--	--
Cape Breton program 2007	1	--	--
Unknown program 2006	1	--	--

4.5 Participation Motivations

When asked their reasons for participating in the DI program in 2010, the majority of respondents reported a financial benefit (84%) as their primary motivation—79% reported saving on energy costs/bills, while 5% reported taking advantage of the incentive. When asked about secondary motivations, a quarter of respondents (25%) reported a desire to help the environment. However, more than one quarter of the respondents (28%) also mentioned a financial benefit as a secondary motivation—13% reported reducing maintenance costs, 10% reported saving on energy costs/bills and 5% reported taking advantage of the incentive. (Table 4-6)

Table 4-6: Reasons for Participating

Most Important Motivation	2008		2009		2010	
	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
Save on energy costs/bills	71%	16%	65% [†]	20% [†]	79%	10%
Help protect the environment	6	29	3	18	8	25
Take advantage of incentive	15 [†]	16 ^σ	13 [†]	8	5	5
Program was free	-- [†]	1	6 ^σ	5	4	3
Reduce carbon footprint	--	4	2	3 [†]	--	11
Reduce maintenance costs	3	10	--	<1 ^{σ†}	--	13
Improve existing lighting conditions	3	9	--	5	--	4
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 ^σ	7 ^{σ†}	1	
Don't know	1 [†]	10 [†]	5	33	3	29

4.6 Participation Barriers

The vast majority of 2010 respondents (92%) reported facing no barriers to participation in the 2010 Direct Install program. Among those who did mention a barrier, the majority were associated with fixture incompatibility (60%). (Table 4-7)

Table 4-7: Barriers Faced During Program Participation

Faced Barriers	2008		2009		2010	
<i>Sample size</i>	70		70		77	
No	86%		75% ^{σ†}		92%	
Yes	11		20 ^{σ†}		7	
Don't know	3		5		1	
Barriers to Implementation	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
<i>Sample size</i>	8	8	17	17	5	5
Incompatible light fixtures	50%	0%	58%	1%	60%	0%
Quality of light	--	--	1	--	20	--
-Financial barrier	--	--	-- [†]	--	20	--
Location of bulbs (height)	13	13	15 ^σ	--	--	--
Heritage building requirements	13	--	-- ^σ	--	--	--
Some fixtures retrofitted before program	13	--	-- ^σ	--	--	--
Not considered a small business	13	--	-- ^σ	--	--	--
Perceived danger of CFL's	--	--	2	--	--	--
Too little incentive	--	--	12 ^{σ†}	--	--	--
Too little information about the program	--	--	12 ^{σ†}	--	--	--
Scheduling	--	--	1	2	--	--
Don't know/None	--	88	--	98	--	100

When asked what was preventing them from pursuing additional energy efficiency measures, two out of five 2010 respondents (40%) were unable to provide a reason. Lack of time was the most frequently-mentioned barrier (25%), followed by lack of additional measures to pursue (8%), lack of financing (8%), lack of interest (8%), and lack of information (8%). (Table 4-8) Interestingly, compared to prior program years, significantly more respondents mentioned lack of time as a barrier and significantly fewer mentioned a lack of additional measures to pursue; this may indicate that potential participants are beginning to recognize additional opportunities but lack the resources (time) to pursue them.

Table 4-8: Barriers to Pursuing Additional Energy Efficiency

	2008	2009	2010
<i>Sample size</i>	51	36	53
Lack of time	8% [†]	9% [†]	25%
No additional measures available	27 [†]	26 ^σ	8
Lack of financing	22 [†]	18	8
Lack of interest	4	14	8
Lack of information	6	-- ^{σ†}	8
Do not own building	10 ^σ	4	2
Decision made elsewhere	2	--	2
Moving	--	--	2
Infeasible	4	5	--
Infrequent use of building	2	4	--
Don't know	16 [†]	20 [†]	40

4.7 Purchase and Use Behaviors

4.7.1 Socket Saturation

In the survey, 2009 and 2010 respondents were asked to quantify the penetration of CFLs and LED exit lights prior to participating in the program and after participating in the program. As Table 4-9 shows, both 2009 and 2010 respondents reported dramatic increases in CFL and LED penetration. Prior to participating in the program, over one-half of 2010 respondents (55%) reported that one-quarter or fewer of their screw-based sockets had contained CFLs and nearly three out of five respondents (58%) reported that none of their exit signs had contained LEDs. In addition, one out of five respondents (20%) reported that their screw-based sockets had contained no CFLs. It is important to note that more than one-quarter of respondents reported that none of their exit signs contained LEDs after program participation and program records indicated that fewer than one-third of participants surveyed (31%) had had any LED exit lights installed. This may indicate the need for program teams to more thoroughly examine opportunities for LED exit lights or opportunities may be lost.

Table 4-9: Socket Saturation*

Percent of available sockets	2009**				2010			
	CFLs		LEDs		CFLs		LEDs	
	Prior to Program	Post Program	Prior to Program	Post Program	Prior to Program	Post Program	Prior to Program	Post Program
<i>Sample size</i>	66	66	55	55	75	75	49	49
Zero	20%	0%	68%	0% [†]	20%	1%	58%	27%
1 to 25	42	12	2	3	35	9	5	--
26 to 50	18	15	4	10	27	9	2	4
51 to 75	8	9	11 [†]	5 [†]	4	13	2	--
76 to 100	12	64	16 [†]	83 [†]	14	67	33	69
Average	27%	76%	29%	65%	30%	80%	36%	70%

*Question not asked in 2008; ** Unweighted data

4.7.2 CFLs Installed and Removed

The majority of respondents (86%) reported not having removed any of the lighting installed through the program, similar to 2008 and 2009 responses. Seven respondents reported having removed CFLs—three said the bulbs had burned out, one said the bulbs had broken, one removed the CFLs because they had heard negative things about CFLs, and two respondents could not provide a reason for removing the CFLs. Four respondents reported having discarded the CFLs after removal, two respondents reported having placed them in storage, and another respondent was unable to recall the disposition of removed CFLs. (Table 4-10)

Table 4-10: Removal of CFLs and LEDs

Products Removed	2008		2009		2010	
<i>Sample size</i>	70		70		77	
Did not remove any lighting	93%		88%		86%	
Removed only LED exit lights	3		--		--	
Removed only CFLs	1		12 ^σ		9%	
Removed some CFLs and some LEDs	1		<1		--	
Don't know	1		--		5	
Reasons for Removing Lights	2008		2009		2010	
	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs
<i>Sample size</i>	3	2	8	1	7	0
Burned out	--	--	5	--	3	--
Broke	--	--	--	--	1	--
Heard negative things about CFLs	--	--	--	--	1	--
Retrofit lighting to T8s	1	--	--	--	--	--
To save energy	1	1	--	--	--	--
Doesn't fit properly	--	--	2	--	--	--
Bulb not bright enough	--	--	1	--	--	--
Don't know	1	1	--	1	2	--
Disposition of Removed Lights	2008		2009		2010	
	CFLs	LEDs	CFLs	LEDs	CFLs	LEDs
<i>Sample size</i>	3	2	8	1	7	0
Threw away	--	--	1	--	4	--
Put in storage	2	1	6	--	2	--
Gave away	--	--	1	--	--	--
Don't know	1	1	--	1	1	--

4.7.3 Purchase Behaviors

Prior to participating in the DI program, nearly seven out of ten 2010 respondents (69%) reported that they had been aware of the benefits of CFLs and more than two out of five (44%) reported that they had been aware of the benefits of LED exit lights. These percentages were similar to those reported by respondents in 2008 and 2009. Overall, nearly seven out of ten respondents (69%) reported having purchased some type of efficient lighting product prior to participating in the program. Among them, nearly all (94%) had purchased CFLs, significantly more than in 2008 or 2009. In contrast to 2009, significantly fewer 2010 respondents reported having replaced T-12 lighting with high efficiency T-8s or T-5s (25% in 2009 and 6% in 2010). (Table 4-11 and Table 4-12)

Table 4-11: Prior Knowledge of Efficient Lighting Products

	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Aware of benefits of CFLs	57%	60%	69%
Aware of benefits of LED exit lights	37%	40% ^σ	44%

Table 4-12: Prior Purchases of Efficient Lighting Products

Previously Purchased Products	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Yes	70%	65%	69%
Type of Purchases	2008	2009	2010
<i>Sample size</i>	49	50	53
CFLs	78% [†]	65% ^{σ†}	94%
T-12 Retrofits	12	25 ^{σ†}	6
LED Exit Lights	14	10	6
Metal halide or high pressure sodium bulbs	4	4	2
Other	8 [†]	15 [†]	--
Don't know	2	<1	--

Slightly more than one-quarter of 2010 respondents (26%) reported having had plans to install CFLs or LEDs prior to participating in the DI program, with most of them having planned to install CFLs alone (20%) or both CFLs and LEDs (5%). (Table 4-13)

Table 4-13: Plans to Install New Lighting Prior to Program Participation

Plans	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Planned to install CFLs and LEDs	13%	12%	5%
Planned to install CFLs	23	18	20
Planned to install LEDs	3	<1	1
Had no plans to install lighting	61	70	69
Don't know	--	--	5

Slightly fewer than one-fifth of 2010 respondents (19%) reported installing additional CFLs or LEDs after participating in the DI program—19% installed CFLs and 3% installed LEDs. Among those respondents who had installed additional CFLs, more than one-third (36%) reported installing CFLs of the same efficiency level or higher. Nearly eight out of ten 2010 respondents (78%) reporting additional installations of CFLs or LEDs indicated that the DI program had influenced their decision to install these additional bulbs.¹³ (Table 4-14 and Table 4-15)

Table 4-14: Post-Program Installations

Installed Additional Lights	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Installed CFLs only	21%	19%	16%
Installed CFLs and LEDs	4	4	3
No additional installations	71	78	79
Don't know	3	<1	3
Efficiency Level of New CFLs			
<i>Sample size</i>	18	22	14
Same or higher	89%	79%	36%
Lower	6	10	50
Don't know	6	11	14
Influence of Program*			
<i>Sample size</i>	18	22	N/A
Influenced decision to install CFLs	33%	60% ^σ	N/A
Influenced decision to install CFLs and LEDs	11	26	N/A
Influenced decision to install LEDs	6	--	N/A
No influence on decision	50	14 ^σ	N/A

*Question not asked in 2010

Table 4-15: Influence of DI Program on Decision to Install Additional CFLs and LEDs

	<i>n</i>	Rating: 5= 'extremely influential' and 1 = 'no influence'				
		5	4	3	2	1
Influence on decision to install additional CFLs and LEDs	14	64%	14	7	14	--

¹³ In 2008 and 2009 respondents were asked if the program had influenced their decision to install additional CFLs or LEDs. In 2010, the survey instrument was changed to ask customers to rate the influence of the program on a scale of 1 to 5, where one indicated that the program had 'had no influence at all' on their decision and 5 indicated that the program had been 'extremely influential' on their decision to install the energy efficient lighting.

Respondents were also asked if participation in the DI program had influenced them to pursue additional energy efficiency actions, other than lighting improvements. Nearly one-third of the respondents (31%) reported that participation had influenced them to take additional actions, about the same as in 2008 and significantly less than in 2009. Of those respondents who had taken additional actions, both engaging in some type of behavior change and making changes to their heating systems were mentioned by one in four respondents (25%), and actions concerning lighting, windows, or energy management systems were each mentioned by fewer than one in five respondents (17%). (Table 4-16)

Table 4-16: Influence of Program on Additional Energy Efficiency Actions

Influenced Additional Actions	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Yes	27%	47% ^{σ†}	31%
No	73	47 ^{σ†}	66
Don't know	--	5 ^σ	3
Additional Actions Taken			
<i>Sample size</i>	19	39	24
Behavior change	58 [†]	19 ^σ	25
Heating	32	4 ^{σ†}	25
Lighting	11	35 ^σ	17
Windows	5	8	17
Energy management system or controls	37	-- ^{σ†}	17
Water conservation	11	9	8
Insulation	16	8	8
Refrigeration	5	5	8
Scoping, feasibility, technical assessments	5	7	4
Solar hot water	--	--	4
Cooling	5	3	--
Applied for a grant	5	--	--
Motors	--	3	--

4.7.4 CFL Usage Behavior

Survey respondents were asked if they used their new lighting more, less, or the same as the lighting that had been replaced. A fourth option was “more, but instead of other less efficient lighting.” The majority of respondents (82%) reported that they used their new lighting ‘about the same’ as the lighting that had been replaced. (Table 4-17)

Table 4-17: Use of New Lighting

	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Use about the same	89%	89%	82%
Use more	1 [†]	3	9
Use less	7	7	4
Use more, but instead of other less efficient lights	1	2	3
Don't know	1	--	3

4.7.5 Future Purchases

When asked about the likelihood of purchasing energy efficiency equipment in the future, the majority of respondents (95%) reported that they would be likely to purchase energy efficient equipment, and four out of five respondents (80%) reported that they would be ‘very likely’ to purchase energy-efficient equipment when replacing equipment in the future. (Table 4-18)

Table 4-18: Future Energy Efficiency Purchases

	Rating: 5= ‘very likely’ and 1 = ‘not at all likely’																	
	2008						2009						2010					
	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1
Likelihood of making energy efficient purchases in the future	67	78%	13	7	1	0	68	81%	19	$\bar{\sigma}$	--	--	76	80%	15	3	1	1

4.7.6 Satisfaction with the Program

Respondents were asked to rate their satisfaction with the DI program overall and with various aspects of the program. Nearly all of the respondents (97%) reported that they were satisfied with the program overall, and more than four out of five respondents (84%) reported they were ‘very satisfied.’ In general, more than nine out of ten respondents reported that they were satisfied with every aspect of the program. Note, however, that significantly fewer 2010 respondents were ‘very satisfied’ with the scheduling and timing of installation (71%) compared to 2009 respondents (83%). (Table 4-19) Significantly more respondents in 2010 (83%) than in 2009 (61%) were ‘very satisfied’ with the CFLs that were installed through the program.

Table 4-19: Satisfaction with DI Program

	Rating: 5= ‘very satisfied’ and 1 = ‘not at all satisfied’																	
	2008						2009						2010					
	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1
Program overall	66	82%	14	3	2	0	68	77%	18	5	0	0	68	84%	13	3	--	--
CFLs installed as part of the program	65	80%	17	3	0	0	69	61% ^{σ†}	36 ^{σ†}	2	0	0	70	83%	16	1	--	--
LEDs installed as part of the program	39	85%	13	3	0	0	40	74% ^σ	26 ^σ	0	0	0	22	86%	14	--	--	--
Interaction and communication with contractors	62	81%	15	5	0	0	68	79%	16	5	0	0	65	75%	20	3	2	--
Initial contact	62	79%	13	5	2	2	64	87%	7	6	0	0	65	71%	20	8	2	--
On-site lighting audit	34	82%	9	6	3	0	51	74%	15	12	0	0	57	75%	21	4	--	--
Scheduling and timing of installation	64	73%	19	5	2	2	67	83% [†]	6 ^{σ†}	8	1	3	66	71%	20	9	--	--
Installation process	61	90%	10	0	0	0	66	80% ^σ	12	8 ^σ	0	0	67	84%	13	3	--	--
Installers or contractors doing the installation work	61	89%	10	2	0	0	65	84%	12	3	--	<1	61	82%	13	5	--	--
Completion of project on schedule	63	84%	10	5	2	0	64	86%	11	3	<1	0	65	82%	12	6	--	--

4.8 Energy Attitudes and Behaviors

About one-half of the 2010 respondents gave a valid response to a question regarding energy costs as a percentage of their annual operating budget. Among them, energy costs accounted for an average of 18% of their annual operating budgets. Overall, energy costs accounted for less than 20% of the annual operating budgets for three out of five respondents (63%) and accounted for more than 20% of the annual operating budgets for two out of five respondents (40%). (Table 4-20)

Table 4-20: Energy Costs as a Percent of Annual Operating Budget

	Respondents		
	2008	2009	2010
<i>Sample size</i>	35	23	40
Less than 10%	20%	43%	28%
10-19%	31	42	35
20-29%	20	2 [†]	13
30-39%	9	1 [†]	15
40-49%	11	6	3
50-59%	3	2	3
60-69%	6	--	3
70-79%	--	--	3
80-89%	--	6	--
90-99%	--	--	--
Average	21.4%	15.4%	18.0%

As in 2008 and 2009, the large majority of respondents reported that reducing energy usage (96%) and managing energy costs (95%) was important to their businesses and around four out of five respondents reported that reducing energy usage (79%) and managing energy costs (85%) were ‘very important’ to them. (Table 4-21)

Table 4-21: Importance of Energy

	Rating: 5= ‘very important’ and 1 = ‘not at all important’																	
	2008						2009						2010					
	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1	<i>n</i>	5	4	3	2	1
Importance of reducing energy usage	70	86%	13	1	0	0	69	83%	8 [†]	9	0	0	76	79%	17	4	--	--
Importance of managing energy costs	69	87%	10	1	1	0	70	77%	15	9	0	0	74	85%	10	3	1	1

One-third of the participants gave a valid response to a question regarding their organizations' payback requirements for energy efficiency measures. Among them, nearly two out of five (38%) required that energy efficiency measures pay for themselves in less than one year. (Table 4-22)

Table 4-22: Required Payback for Energy Efficiency Measures

Months	Respondents		
	2008	2009	2010
<i>Sample size</i>	39	20	26
0 to 12	56%	58%	38%
13 to 24	18 [†]	10 [†]	35
25 to 36	8	4	8
37 or more	18	27	19
Average	25.7	32.6	26.2

4.9 Firmographics

The 2010 survey respondents had generally similar firmographic profiles to 2009 and 2008 survey respondents. An exception to this was the breakdown of business types present in the samples. Significantly fewer retail businesses (other than mall) participated in the 2010 survey as compared with 2008 and 2009. The majority of respondents in the 2010 sample and the total population were concentrated in a few business types including lodging, office, retailers, food service, and agriculture. It is important to note that the 2010 program records contained business type information for only about one-half (53%) of program participants. (Table 4-23)

Table 4-23: Business Type

	2008		2009		2010	
	Survey Respondents	Population*	Survey Respondents	Population*	Survey Respondents	Population*
<i>Sample size</i>	70	1,076	67	1,512	74	2,884
Lodging – including apartment buildings	20% [†]	14%	33%	0%	34%	30%
Office	11	16	9	--	17	--
Retail - other than mall	21 [†]	21	21 [†]	32	10	30
Food service	6	7	2 [†]	9	10	7
Agriculture	-- [†]	--	-- [†]	--	10	--
Public assembly	10	11	-- ^{σ†}	11	4	21
Warehouse or storage	1	1	-- [†]	--	4	--
Enclosed or strip mall	1	1	7 ^σ	--	4	--
Service	3	6	5	7	3	2
Public order & safety	1	1	--	--	3	--
Religious worship	19 [†]	10	-- ^σ	14	--	8
Education	4 [†]	3	7 [†]	--	--	--
Seniors' home	1	8	6 [†]	27	--	2
Recreation	--	--	5 ^{σ†}	--	--	--
Manufacturing	--	--	2	--	--	--
Other/Missing (Count)	--	11	4	1,924	3	2,563

* Based on program tracking records.

Nearly two out of three 2010 respondents (62%) reported having facilities with less than 50,000 square feet of floor space; nearly two out of five (39%) reported having facilities with less than 5,000 square feet of floor space. (Table 4-24)

Table 4-24: Building Floor Space

Square meters (square feet)	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
93 or less (1,000 or less)	14%	12%	8%
93 to 463 (1,000 to 4,999)	27	32	31
465 to 929 (5,000 to 9,999)	13	6	10
930 to 4,645 (10,000 to 49,999)	19	16	13
4,646 to 9,290 (50,000 to 99,999)	1	<1	4
Over 9,290 (Over 100,000)	7	11	4
Don't know	19	23	30

* Based on program tracking records.

Nearly three out of five 2010 respondents (57%) reported having fewer than five employees; about three out of four (73%) reported having fewer than 10 employees. (Table 4-25)

Table 4-25: Full-time Equivalent Workers

	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Fewer than 5	54%	67%	57%
5 to 9	11	14	16
10 to 19	16	6 ^σ	9
20 to 49	11	3 ^σ	5
50 to 99	-- [†]	2	4
100 to 249	3	1	3
250 or more	1	2	1
Don't know	1	4	5

Slightly more than four out of five 2010 respondents (82%) reported that their businesses were independent and not part of a larger company. (Table 4-26)

Table 4-26: Type of Company

	Respondents		
	2008	2009	2010
<i>Sample size</i>	70	70	77
Independent	69% [†]	72%	82%
Part of a larger company	31 [†]	26	18
Government	--	2	--

Appendix A Stratified Ratio Estimation

The on-site engineering assessment used engineering analysis and surveys to derive the gross savings estimates for each individual sample participant. In turn, the statistical analysis combines these gross savings estimates for the sample of participants with their tracking system counterparts in a stratified ratio estimation framework to produce the independent estimates of gross program impacts, i.e., annual energy savings. Case weights developed at the time of the sample design were updated, if necessary, and used to develop the population weighted estimates of the total gross savings and net savings. The case weights were defined for each sample point based on the number of participants in the population (N) represented by each sample point (n). Therefore, the case weights were defined as $(w_k)=N_h/n_h$. The equations for the combined stratified ratio estimator are presented below:

$$\begin{aligned}\hat{Y}_{ra} &= b\bar{X}, \text{ where} \\ b &= \frac{\bar{y}}{\bar{x}} \\ \bar{y} &= \frac{1}{N} \sum_{k=1}^n w_k y_k \\ \bar{x} &= \frac{1}{N} \sum_{k=1}^n w_k x_k \\ \hat{N} &= \sum_{k=1}^n w_k\end{aligned}$$

This first set of equations present the population estimate of y , e.g., the gross annual savings as beta times the population tracking system estimate of savings, namely, $b\bar{X}$. The beta coefficient (b) is the ratio of weighted mean y to weighted mean x , where y is the engineering estimate of savings derived from the on-sites and x is the tracking system estimate of savings. Next, we present equations for the weighted mean estimate of y , the weighted mean estimate of x and the estimate of N , i.e., the number of projects in the population. Equations for the confidence interval of the estimate, the estimated variance, the within-stratum variance of the sample residual, e , and the sample residual are presented below:

$$\begin{aligned}\hat{Y}_{ra} &\pm 1.645 \sqrt{V(\hat{Y}_{ra})} \text{ where} \\ V(\hat{Y}_{ra}) &= \sum_{h=1}^H N_h^2 \left(1 - \frac{n_h}{N_h}\right) \frac{s_h^2(e)}{n_h} \\ s_h^2(e) &= \frac{1}{n_h - 1} \sum_{k \in S_h} (e_k - \bar{e}_h)^2 \\ e_k &= y_k - bx_k\end{aligned}$$

Next, the relative precision of the estimate $\hat{Y}_{ra}$ was calculated using the equation:

$$rp = \frac{1.645 \sqrt{V(\hat{Y}_{ra})}}{\hat{Y}_{ra}}$$

Appendix B INTERVIEW QUESTIONNAIRES & GUIDES

PARTICIPANT QUESTIONNAIRE: NSPI ELP DIRECT INSTALL PROGRAM

Hello, my name is _____ from NMR Group. I am calling on behalf of Nova Scotia Power, as part of an evaluation study of their energy efficiency programs. Our records indicate that you or your firm recently participated in Nova Scotia Power's Efficient Lighting Products Program. We would appreciate fifteen minutes of your time to answer some questions related to your participation in this program, the information you provide will be used to help Nova Scotia Power evaluate and improve the program. Is this a good time for you?

1. Our records indicate that your company / organization participated in Nova Scotia Power's Efficient Lighting Products Program. Is this correct?
 1. Yes (Go to Q3)
 2. No
2. Is there someone else at your company / organization who would know about your company / organization's participation in Nova Scotia Power's Efficient Lighting Products Program?
 1. Yes (Ask for name: _____ and telephone #: _____) (Thank and terminate. Schedule interview with best contact.)
 2. _____
 3. No (Thank and terminate)
3. Are you the person in your company / organization who is most knowledgeable about your experience with the Efficient Lighting Products Program?
___ Yes (If YES go to Q5)
___ No
4. We would like to talk to the person who is the most knowledgeable about your experience with the Efficient Lighting Products 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 I. Reasons for participating & Previous Purchases

5. Did your company / organization participate in any other Nova Scotia Power energy efficiency programs before participating in the Efficient Lighting Products Program?
- Yes
- No (Go to Q8)
6. Which programs did your company / organization participate in prior to the Efficient Lighting Products 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
7. **(REPEAT FOR EACH PROGRAM IDENTIFIED IN Q6)** In what year did your company / organization participate in [Program x]? Before 2000
1. 2000
2. 2001
3. 2002
4. 2003
5. 2004
6. 2005
7. 2006
8. 2007
9. 2008
10. 2009
11. 2010
99. Don't Know
8. How did you first learn about the Efficient Lighting Products Program? [RANDOMIZE AND READ 1-8, THEN 9] **(Choose one)**
1. From a phone call from an Efficient Lighting Products Program / program representative
2. From a visit from an Efficient Lighting Products Program / program representative
3. From Efficient Lighting Products Program literature I received in the mail
4. From Nova Scotia Power's website
5. From a Nova Scotia Power presentation
6. From a Nova Scotia Power staff person
7. By a visit at my business by an Efficient Lighting Products Program staff person
8. From a business associate or friend (word of mouth)
9. From someone who had previously participated in the Efficient Lighting Products Program
10. Or some other way? (Please Specify: _____)
99. Don't know

9. What was the ONE most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)
10. What was the second most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)
11. Prior to your company / organization participating in the Efficient Lighting Products Program were you aware that you might be able to benefit from installations of CFLs at your company / organization?
1. Yes
 2. No
 9. (Don't know/Don't recall)
12. Prior to your company / organization participating in the Efficient Lighting Products Program were you aware that you might be able to benefit from installations of LED exit lights at your company / organization?
1. Yes
 2. No
 9. (Don't know/Don't recall)

13. Prior to your company / organization participating in the Efficient Lighting Products Program had your company / organization purchased any energy efficient lighting products?

1. Yes
2. No (Go to Q14c)
9. (Don't know/Don't recall (Go to Q14c))

14. What purchases of energy efficient lighting had your company / organization made before participating in the Efficient Lighting Products Program? (**Check all that apply**)

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
5. Other (Specify: _____)
9. (Don't know/Don't recall)

14c. **Before** participating in the Efficient Lighting Products Program, 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] _____% [999 = Don't know/Don't recall]

14d. **After** participating in the Efficient Lighting Products Program, 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] _____% [999 = Don't know/Don't recall]

14e. **Before** participating in the Efficient Lighting Products Program, 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] _____% [999 = Don't know/Don't recall]

14f. **Before** participating in the Efficient Lighting Products Program, what percentage of your company's / organization's exit signs contained an incandescent lamp? [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] _____% [999 = Don't know/Don't recall]

14g. **After** participating in the Efficient Lighting Products Program, what percentage of your company's / organization's exit signs contained LED 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] _____% [999 = Don't know/Don't recall]

Section II. In-service, Free-ridership, Snapback/forward, Spillover

[NOTE: TO ESTIMATE WATTAGE REDUCTION, WE PLAN TO OBTAIN INFORMATION ON BULBS REPLACED AND INSTALLED FROM *FOOTPRINTS* WEBSITE]

IN-SERVICE

15. Have you removed any of the compact fluorescent light bulbs or LED exit lights installed as part of the Efficient Lighting Products Program?
 1. Yes, removed only CFLs (Ask Q16-Q19, and then skip to FR1)
 2. Yes, removed CFLs and LED exit lights (Continue)
 3. Yes, removed only LED exit lights (Go to Q20)
 4. No (Go to FR1)
 5. (Don't know/Don't recall (Go to FR1))

16. For the next few questions I would like you to think about JUST those compact fluorescent light bulbs installed through the Efficient Lighting Products Program. What percent of these bulbs are currently installed in lamps or fixtures at your company / organization? [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] _____% [999=Don't know/Don't recall]

17. What percent of these compact fluorescent bulbs did you remove? Again, I'm asking only about those compact fluorescent light bulbs installed through the Efficient Lighting Products Program. PERCENT OF BULBS _____% [IF Q15 = 2 AND Q17=0 GO TO Q20] [IF Q15 = 1 AND Q17=0 GO TO FR1] [999=Don't know/Don't recall]

18. What was ONE main reason you removed the compact fluorescent 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)
- 14. (Other [Specify _____])
- 99. (Don't know/Don't recall)

What did you do with the compact fluorescent bulbs you removed?

(Threw away)

(Put them away, stored them)

(Gave them away)

(Installed them at another location)

(Other [Specify _____])

9. Don't know/Don't recall

(IF Q15=1, Go to FR1)

For the next few questions I would like you to think about JUST those LED exit lights installed through the Efficient Lighting Products Program. What percent of these bulbs are currently installed at your company / organization? [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] _____% [999=Don't know/Don't recall]

What percentage of these LED exit lights did you remove? Again, I'm asking only about those LED exit lights installed through the Efficient Lighting Products Program.

PERCENT OF BULBS ____% [IF ZERO GO TO FR1] [999=Don't know/Don't recall]

What was ONE main reason you removed the LED exit lights from service? **(Do not read)**

(Bulb is too bright)

(Bulb is not bright enough)

(Don't like the overall quality of the light)

(Don't like the color of the light – it is too [Specify:_____])

(Delay in light coming on)

(Interference with radio, TV, other electronic devices)

(Light beginning to dim)

(Light flickers)

(Burned out)

(Broke)

(Doesn't fit properly)

(Didn't like appearance in fixture/bulb is ugly)

(Bulb contains mercury)

(Other [Specify _____])

99. (Don't know/Don't recall)

What did you do with the LED exit lights you removed?

(Threw away)

(Put them away, stored them)

(Gave them away)

(Installed them at another location)

(Other [Specify _____])

9. Don't know/Don't recall

FREE-RIDERSHIP

FR1. Did your company / organization have any specific plans to install CFLs or LED exit lights prior to talking with anyone about the Efficient Lighting Products Program? (**Do not read**)

(Yes, Planned to install both CFLs and LED exit lights)

(Yes, Planned to install CFLs)

(Yes, Planned to install LED exit lights)

(No)

9. (Don't know/Don't recall)

Now I would like to ask you to consider what actions you would have taken in the absence of the Efficient Lighting Products Program. I will ask you to give your responses separately for CFLs and LEDs.

If your company / organization had not participated in the Efficient Lighting Products Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have...
[For FR2a – h 1 = YES, 2 = NO, 9 = Don't know; For FR2e-f if YES ask FR2ei & FR2fi]

FR2a. [IF CFLFlag = 1] Postponed installing CFLs by more than one year

FR2b. [IF LEDFlag = 1] Postponed installing LED exit lights by more than one year

FR2c. [IF CFLFlag = 1] Would not have installed any CFLs

FR2d. [IF LEDFlag = 1] Would not have installed any LED exit lights

FR2e. [IF CFLFlag = 1] Would have installed fewer CFLs

FR2ei. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) fewer CFLs?]

FR2f. [IF LEDFlag = 1] Would have installed fewer LED exit lights

FR2fi. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) fewer LED exit lights?]

FR2g. [IF CFLFlag = 1] Would have installed the same number of CFLs that were installed through the program

FR2h. [IF LEDFlag = 1] Would have installed the same number of LED exit lights that were installed through the program

FR3. [IF CFLFlag = 1] If Nova Scotia Power had not installed CFLs for free, could your budget have accommodated the full cost of installing the CFLs? Not including installation costs, the CFLs would have cost approximately **[READ FROM SAMPLE FILE - CFLCost]**.

Yes

No

9. (Don't know)

FR4. [IF LEDFlag = 1] If Nova Scotia Power had not installed LEDs for free, could your budget have accommodated the full cost of installing the LED exit lights? Not including installation costs, the LED exit lights would have cost approximately **[READ FROM SAMPLE FILE]**.

Yes

No

9. (Don't know)

FR5. [IF CFLFlag = 1] How influential were the following to your decision to install CFLs? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your

decision to install the energy efficient CFLs” and 5 indicates that the program was “extremely influential to your decision to install the energy efficient CFLs.” How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. Free CFLs	1 no influence	2	3	4	5 extremely influential	9 DK
b. Free Installation services	1 no influence	2	3	4	5 extremely influential	9 DK
c. Information received during the initial contact by the program representative	1 no influence	2	3	4	5 extremely influential	9 DK

FR6. [IF LEDFlag = 1] How influential were the following on your decision to install LED exit lights? Please, give your answer on a scale of 1 to 5, where 1 indicates that the program “had no influence at all on your decision to install the LED exit lights” and 5 indicates that the program was “extremely influential to your decision to install the LED exit lights.” How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. Free LED exit lights	1 no influence	2	3	4	5 extremely influential	9 DK
b. Free Installation services	1 no influence	2	3	4	5 extremely influential	9 DK
c. Information received during the initial contact by the program representative	1 no influence	2	3	4	5 extremely influential	9 DK

24a. [IF CFLFlag = 1] Overall, how satisfied are you with the CFLs installed by the Efficient Lighting Products 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
6. (Don't know/Refused)

24a1. [IF Q24a = 4 OR 5] Why are you not satisfied with the CFLs? [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)
17. (Other [Specify _____])
18. (Don't know)

24b. [IF LEDFLag = 1] Overall, how satisfied are you with the LED Exit Lights installed by the Efficient Lighting Products 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
6. (Don't know/Refused)

24b1. [IF Q24b = 4 OR 5] Why are you not satisfied with the LED Exit Lights? [MULTIPLE MENTION, DON'T READ LIST]

Light Quality

1. (Light is too bright)
2. (Light 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/ light is ugly)
17. (Other [Specify _____])

18. (Don't know)

SNAPBACK / SNAP FORWARD

Which of the following statements would you say is most accurate about your company / organization's use of the new lighting that was installed through the Efficient Lighting Products Program?

Use lights more than the lights that were replaced

Use lights less than the lights that were replaced

Use lights the same amount as the lights that were replaced

Use the lights more, but instead of other less efficient lights

9. Don't know/Don't recall

SPILLOVER

Now I'd like you to think of the time since you participated in the Efficient Lighting Products program. Has your company purchased and installed any additional CFLs or LED exit lights on your own for this or other facilities served by Nova Scotia Power?

___ Yes, purchased and installed both CFLs and LED exit lights

___ Yes, purchased and installed only CFLs

___ Yes, purchased and installed only LED exit lights [Go to Q0]

___ No [Go to Q0]

9. ___ Don't know/Don't recall [Go to Q0]

Were the additional CFLs you installed of the same or higher level of efficiency as the CFLs that were installed through the Efficient Lighting Products program?

___ Yes

___ No [If purchased and installed both CFLs and LED exit lights, Go to Q0, Else go to Q0]

9. ___ Don't know/Don't recall
[If purchased and installed both CFLs and LED exit lights, Go to Q0, Else go to Q0]

[IF Q0=YES] About what quantity of these additional CFLs did your company / organization purchase on its own since participating in this program? Please give your response as a percentage of the quantity of CFLs installed through the program? ___ ___ % (Don't know=999)

About what quantity of these additional LED exit lights did your company / organization purchase on its own since participating in this program? Please give your response as a percentage of the quantity of LED exit lights installed through the program? ____% (Don't know=999)

Did your experience with the CFLs and LED exit lights installed through the Efficient Lighting Products program influence your decision to install some or all these CFLs and/or LED exit lights on your own? Please, give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to install the energy efficient lighting" and 5 indicate that the program was "extremely influential to your decision to install the energy efficient lighting." [record response on scale of 1 to 5, 9 = Don't know]

Has your participation in the Efficient Lighting Products Program influenced any other energy efficiency actions taken by your company / organization?

Yes

No [Go to Q0]

9. (Don't know/Don't recall [Go to Q0])

What are the other measures that your company / organization has implemented or is currently pursuing?

Scoping, feasibility or technical assessments

Motors

AC

Heating

Insulation

Windows

Energy management system or controls

Behavior changes (e.g. thermostat)

Air Compression

Refrigeration

Other (Specify: _____)

(Go to Q0)

What is the most important reason your company / organization has not pursued additional energy efficiency measures at this location? **(Do not read)**

(No interest in pursuing other energy efficiency measures)

(No time to pursue other energy efficiency measures)

(Concern that actual bill savings would be less than estimated)

(Lack of information to make an informed decision)

(Lack of financing)

(Energy efficient equipment does not meet payback requirements)

(Decision made elsewhere)

(Do not own building – have to work through owner)

(Other (Specify: _____))

99. (Don't know/Don't recall)

In number of years or months, how quickly does your company / organization require energy efficiency measures pay for themselves in order for your company / organization to implement a measure—that is, what are your payback requirements? [999 = Don't know/don't recall]

—

Section III. Satisfaction with Program & Future Purchase Intentions

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 Efficient Lighting Products Program? [9 = Don't know/Don't recall] RANDOMIZE A-H; THEN ASK I

— Interaction and communication with contractors

— Initial contact

— Audit technician or contractor

— On-site lighting audit

— Scheduling and timing of the installation

— The installation process

— Installers or contractors doing installation work

— Completion of project on schedule

— The program overall

On a scale of 1 to 5, where 1='not at all likely' and 5='very likely', how likely will your company / 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]

—

Section IV. Barriers to Action & Recommendations for Improvements

Were there any challenges or barriers that your company / organization faced in implementing the energy efficiency measures provided through the program?

— Yes

— No [Go to Q45]

9. (Don't know/Don't recall) [Go to Q45]

What was the most important barrier? **(Do not read)**

— (Concern that actual bill savings would be less than estimated)

— (Lack of information to make an informed decision)

— (Too little incentive)

— (Too much work required to obtain funding)

— (Too little information about the program)

— (Cost savings not worth the effort of applying)

— (Approval takes too long)

— (Lack of financing)

— (Energy efficient equipment does not meet payback requirements)

— (Decision made elsewhere)

— (Do not own building – have to work through owner)

— (Other (Specify: _____))

99. (Don't know/Don't recall)

What was the second most important barrier? **(Do not read)**

— (Concern that actual bill savings would be less than estimated)

— (Lack of information to make an informed decision)

— (Too little incentive)

— (Too much work required to obtain funding)

- ___ (Too little information about the program)
- ___ (Cost savings not worth the effort of applying)
- ___ (Approval takes too long)
- ___ (Lack of financing)
- ___ (Energy efficient equipment does not meet payback requirements)
- ___ (Decision made elsewhere)
- ___ (Do not own building – have to work through owner)
- ___ (Other (Specify: _____))

99. (Don't know/Don't recall)

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? [9 = Don't know/Don't recall]

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? [9 = Don't know/Don't recall]

What percent of your annual operating budget do energy costs account for? [999 = Don't know/Don't recall]

___%

Do you have any suggestions on how to improve the Efficient Lighting Products Program? Consider all aspects of the program: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms.

Now we would like to talk to you about the hours that your business is open.

What are your normal hours of operation for each day of the week? [7777=CLOSED / NOT OPEN]
[9999=Don't know/Don't recall]

	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		

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 Q0]

Are there specific periods of the year that your business is closed?

Yes

No (Go to Q0)

9. Don't know/Don't recall (Go to Q0)

Approximately, when are those periods? [RECORD MONTH AND DATE THE PERIOD STARTS AND WHEN IT ENDS. RECORD UP TWO THREE PERIODS] [99 / 99 =Don't know/Don't recall]

PERIOD ONE. **From** ____/____ **To** ____/____
MM DD MM DD

PERIOD ONE. **From** ____/____ **To** ____/____
MM DD MM DD

PERIOD ONE. **From** ____/____ **To** ____/____
MM DD MM DD

During normal business hours, what percentage of your lights does your company / organization use when it is... [999=Don't know/Don't recall]

Cloudy __ __ __%

Dark __ __ __%

Bright __ __ __%

Section IV. Firmographics

What is the principal building activity where the energy efficiency improvements were implemented?
[DO NOT READ—BUT CONFIRM WITH RESPONDENT THAT THE CATEGORY YOU CHOOSE IS CORRECT]

☐ Education

☐ Food Sales (grocery)

☐ Food Service (restaurant)

☐ Health Care - Inpatient

☐ Health Care - Outpatient

☐ Health Care - Inpatient & Outpatient

Lodging

☐ Mercantile – Enclosed and Strip Malls

☐ Mercantile – Retail (Other than Mall)

☐ Office

☐ Public Assembly

☐ Public Order and Safety

☐ Religious Worship

☐ Service

☐ Warehouse and Storage

☐ Manufacturing (Identify Industry Type _____)

(e.g., chemical, food, paper, etc.) NOT IN CBECS

☐ Other

☐ Vacant

99. (Don't know/Don't recall)

Into which of the following categories does your building floor space fall? (square meters)

- ☐ 93 or less
- ☐ 93 - 463
- ☐ 465-929
- ☐ 930-4645
- ☐ 4646-9290
- ☐ Over 9290

99. (Don't know/Don't Recall)

Approximately how many full-time equivalent workers are employed at this facility?

- ☐ Fewer than 5
- ☐ 5 to 9
- ☐ 10 to 19
- ☐ 20 to 49
- ☐ 50 to 99
- ☐ 100 to 249
- ☐ 250 or More

9. (Don't know/Don't recall)

Is your company independent, or part of a larger company?

- ☐ Independent
- ☐ Part of a larger company
- ☐ Don't know
- ☐ Refused
- ☐ Other (_____)

9. (Don't know/Don't recall)



Process and Impact Evaluation: Prescriptive Rebate Programs 2010

February 25, 2011

Final Report

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Efficiency Nova Scotia Corporation

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Executive Summary

This report presents the results of the 2010 process and impact evaluations of the Business Energy Rebate (BER) and Smart Lighting Choices (SLC) programs conducted by NMR Group, Inc.¹ (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

The impact evaluation was based on eleven site visits with 2010 program participants. For the BER program, the process evaluation was based on in-depth interviews with DSM Administrator staff and one in-depth interview with a program participant as well as telephone surveys with eleven participants in the 2010 program.

For the SLC program, the DSM Administrator expects that the Nova Scotia will pass legislation which will mandate that all T8 lighting sold in the province be High Performance (HP) T8 lighting. This legislation will render the SLC program superfluous. Accordingly, for the 2010 SLC program, NMR focused on measuring the impacts only, since any effort to improve the program through a process evaluation would have been of limited value as the SLC program will be terminated once the legislation is enacted. The impact evaluation was based on visits to nine sites with installed lighting and visits with four of the six major distributors for the program.

Impact Evaluation Findings

For the BER program, the impact evaluation drew upon a review of program records, telephone survey data and on-site visits to a sample of participating businesses. The telephone surveys were used to estimate free-ridership and spillover. For the SLC program, the impact evaluation drew upon a review of program records, site visits to nine end-use customers with installed lighting, visits to four of the six major distributors in the program, and the free-ridership and spillover findings from the 2009 SLC evaluation. The NMR team estimated that the combined net generator-level impacts from the 2010 BER and SLC programs were 6,748.3 MWh of energy savings and 1,267.37 kW of demand savings. This fell short of the combined program targets of 10,000 MWh of energy savings and 2,420.0 kW of demand savings.² (Table 1)

Table 1: Program Energy and Demand Savings Summary

	BER		SLC		Total	
	Peak Demand (kW)	Energy (MWh)	Peak Demand (kW)	Energy (MWh)	Peak Demand (kW)	Energy (MWh)
Gross Savings at Generator	134.8	932.0	1,422.0	7,434.5	1,556.8	8,366.5
Net-to-Gross Ratio (%)	54%	54%	84%	84%	N/A	N/A
Net Savings at Generator	72.8	503.3	1,194.5	6,245.0	1,267.3	6,748.3

¹ These two programs are known collectively as the Prescriptive Rebate Programs.

² These targets included 8 GWh of energy savings and 2.03 MW of demand savings for Prescriptive – Retrofit and 2 GWh of energy savings and 0.39 MW of demand savings for Prescriptive – New Construction.

Key Findings: BER³

The BER program was a new program in the DSM Administrator's portfolio for 2010 and was launched on June 28th, 2010. Thirteen customers participated in the BER program and received an incentive from the DSM Administrator in 2010. Given the time required to build awareness and generate interest in a new program, the impact of the BER program is likely to be perceived more fully in 2011. Despite this, there are signs that businesses in Nova Scotia are interested in a program that offers incentives for energy efficient equipment. All of the participants interviewed as part of the 2010 evaluation said that managing and reducing energy costs were important to their business and the majority of respondents were satisfied with the program.

Notwithstanding the high levels of satisfaction, the DSM Administrator should work with participants, contractors, and other stakeholders to improve incentive levels and develop a rational incentive structure—the only source of concern about the program expressed by some participants. In addition, the DSM Administrator should work with participants to help secure additional energy savings from their businesses.

Findings and Recommendations

Finding	Recommendation
BER-F1. Unlike the C&I Custom program, the BER program did not incorporate any checks to ensure that participants do not proceed with program implementation in the absence of funding from the DSM Administrator. In 2008, 2009, and 2010, NMR found consistently low levels of free-ridership for the C&I Custom program. In 2010, NMR found fairly high levels of free-ridership for the BER program (46%).	BER-R1. While higher levels of free-ridership may be acceptable for a new program that is seeking to gain traction in the market, as the BER program matures, the DSM Administrator should consider including a similar free-ridership screening process for the BER program. The DSM Administrator could limit these checks to larger projects by requiring them only on equipment over \$2,000 in cost. In keeping with the nature of the BER program, the free-ridership screening should be limited to a simple form that customers can fill out with project specific information.
BER-F2. Nearly all of the respondents (10 out of 11) said that someone outside their organizations had been responsible for specifying the measures that were installed through the BER program. In addition, seven out of the eleven respondents said that a contractor (5) or a design professional (2) had been responsible for specifying equipment installed.	BER-R2. In 2011, the BER program should continue to build awareness and reach with customers. Contractors and design professionals represent channels that may be effectively utilized to promote the program.

³ Note that the numbering for these findings and recommendations corresponds to the numbering in a composite table in the overall Executive Summary of the evaluation of all of the DSM Administrator's 2010 Demand Side Management programs.

Findings and Recommendations

Finding	Recommendation
BER-F3. Customers were motivated to participate in the BER program primarily because of a financial benefit—nine said energy savings was their primary (6) or secondary (3) motivation and an additional three respondents said that the program incentive was their secondary motivation. In addition, saving on energy bills was the most frequently cited reason for installing energy efficient equipment. Three out of the four respondents who installed energy efficient lighting, both respondents who installed new motors/variable speed drives, and all three respondents who installed HVAC equipment reported this as their most important motivation.	BER-R3. When working with customers and training contractors, focus on the energy and bill savings opportunities offered by installation of the program measures.
BER-F4. The BER program was designed to be a streamlined prescriptive program. Not surprisingly, nearly all the respondents (ten out of eleven) experienced no barriers while participating in the BER program. The one respondent who reported facing a barrier said that it had taken too long to find out if they were eligible to participate.	BER-R4. The BER should continue to work with customers to avoid creating barriers to program participation. Given the prescriptive and streamlined nature of the program, the DSM Administrator should consider assigning sufficient resources to respond to customer inquiries; and, when appropriate, to elevate customers quickly to the C&I Custom program if their projects appear to be too complex to be quickly approved.
BER-F5. The majority of respondents were satisfied with the program. On a scale from one (“not at all satisfied”) to five (“very satisfied”), eight out of the eleven respondents gave a rating of four or five to the program overall, while the other three respondents gave the program a rating of three. With the sole exception of rebate amounts, the other specific aspects of the program each received high satisfaction ratings from the majority of respondents.	BER-R5. As the BER program gains traction in the market and grows, it should be careful to maintain its standards for customer service and responsiveness while scaling up operations.
BER-F6. Despite high levels of satisfaction, respondents were least satisfied with rebate amounts offered by the program. In addition, in an in-depth interview with a BER participant, the participant said, <i>“The challenge with [the BER program is that] the program is fairly new. Some of the rebates don’t accurately depict or give you enough incentives to implement the application or the product.”</i>	BER-R6. The need to make adjustments in incentives is not an unexpected obstacle in the inaugural year of a new program. In the in-depth interviews, the program manager brought up incentives as a potential obstacle for the 2010 program year and said that incentive levels may require adjustments over time based on feedback from participants and other factors. The DSM Administrator should examine the scope for increasing rebate amounts, taking into consideration cost-effectiveness as well as input from customers, contractors, and vendors.

Findings and Recommendations

Finding	Recommendation
BER-F7. All of the respondents said that managing and reducing energy costs were important to their business and ten out of eleven said they were 'very important.' Despite the importance of managing and reducing energy usage and costs, none of the respondents reported having participated in any DSM Administrator sponsored rebate programs prior to the BER program and relatively few respondents reported taking any additional energy efficient actions after participating in the program.	BER-R7. BER participants appear to be a group of customers highly motivated to reduce energy usage and costs but have not been taking action. After participants complete projects through the BER program, the DSM Administrator should take the opportunity to help them identify additional projects to manage their energy usage and reduce costs.

1 Program Descriptions: Business Energy Rebate

The Business Energy Rebate (BER) program was a new addition to the DSM Administrator's portfolio of energy efficiency programs, implemented on June 28, 2010. The BER program provides financial incentives, through prescriptive rebates, to businesses for the purchase of qualified energy efficient equipment. Eligible product categories include:

- lighting,
- motors and drives,
- HVAC,
- refrigeration and
- compressed air equipment.

The BER program was modeled closely after successful prescriptive programs offered in other markets, specifically Efficiency Vermont (EVT). The technologies targeted for the initial launch were recommended by EVT as having the best suitability for early uptake. EVT further assisted by providing eligibility criteria, savings estimates and approved product lists.

1.1 Program Theory

Program Background

The BER program was primarily designed to be a Resource Acquisition program with the objective of helping businesses throughout Nova Scotia with the purchase of energy efficient equipment. However, the BER program has a long-term goal to propel Market Transformation by changing the standard practice of business customers to adoption of energy efficient technologies. Customers must first purchase and install energy efficient equipment and then may apply for reimbursement through the program.

Program Activities

The program's interaction with customers generally follows the process outlined below:

- **Outreach and marketing.** In addition to advertising through newspapers, websites and an outbound commercial call group, the C&I Sales Leads and a marketing contractor actively engage customers in discussions regarding their energy use and potential for energy efficient equipment purchases.
- **Identification and purchase of eligible products.** Customers can identify eligible equipment by downloading the appropriate rebate forms from the DSM Administrators website or by contacting the DSM Administrator directly.
- **Obtain DSM Administrator authorization.** For equipment over \$2,000, customers first need to contact the DSM Administrator and seek approval in writing.
- **Installation of equipment.** Customers purchase and install qualifying energy efficient equipment at their business.
- **Rebate processing.** After customers have purchased and installed the energy efficient equipment, they must fill out the rebate forms and send them to the DSM Administrator for processing. Customers have 90 days from the date they purchased the equipment to apply for a rebate.

Program Assumptions

The following assumptions underlie the program's process:

- **Outreach and marketing.** The outreach performed by the Sales Leads, a marketing contractor, and the outbound commercial call group will be sufficient to generate interest among potential participants.
- **Availability of funding.** Customers have access to sufficient capital or financing to fund the purchase of energy efficient equipment.
- **Availability of equipment.** Customers have access to energy efficient equipment in the marketplace.
- **Skills and equipment.** Customers have the equipment, tools and skills required to install energy efficient equipment or they can contract for such services.

Program Barriers

- **Lack of knowledge of energy efficiency opportunities.** Customers may not be aware of the opportunities to save energy in their facilities nor of the availability of energy efficient technologies that can help them achieve energy savings.
- **Lack of time to identify opportunities to improve energy efficiency.** Customers may be busy with their day-to-day business activities and may not have the time available to focus on identifying opportunities to improve the energy efficiency of their facilities.
- **Lack of capital or other financial hurdles.** Since the program does not offer up-front funding, customers must have sufficient available funds to purchase the energy efficient equipment and apply for rebates later, after having purchased and installed the equipment.

Short-Term Outcomes

- **Generate customer interest.** Customers are made aware of the program by marketing and outreach activities.
- **Customers purchase energy efficient equipment.** After becoming aware of the program, customers identify and purchase energy efficient equipment.
- **Customers install energy efficient equipment.** After purchasing energy efficient equipment, customers install the energy efficient equipment.

Mid-Term Outcomes

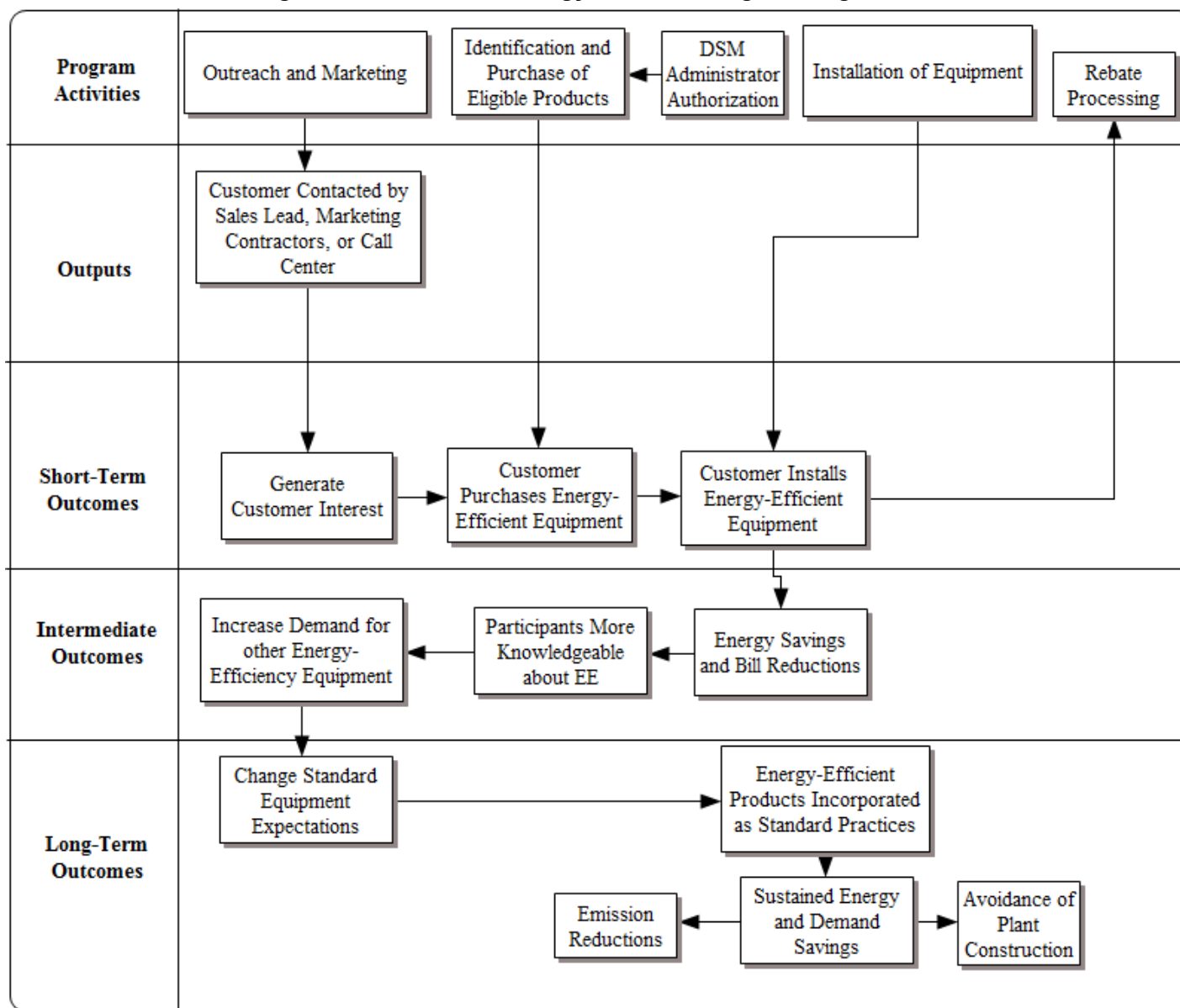
- **Energy savings and bill reductions.** Energy savings are achieved when customers install energy efficient equipment.
- **Participants are more knowledgeable about energy efficiency.** Businesses gain first-hand understanding about the benefits of purchasing energy efficient equipment.
- **Increase in demand for energy efficient lighting equipment.** Participants who install energy efficiency equipment recognize its benefits and continue to purchase energy efficient equipment.
- **Increase in demand for other energy efficient equipment.** Based on their experience with the BER program and their increased understanding of the benefits of energy efficient equipment, participants will consider energy efficiency when making decisions about other energy using equipment.

Long-Term Outcomes

- **Sustained energy and demand savings.** Long-term energy and demand savings are achieved.
- **Emission reductions.** Energy savings translate into a reduction in emissions.
- **Avoidance of plant construction.** Demand and energy savings reduce the need for new generation.
- **Raise expectation of equipment standards for small businesses.** Businesses expect a higher level of standard for energy-using equipment.
- **Business customers incorporate energy efficient products and services as standard practices.** Due to first-hand experience, energy efficient products become standard practice for business customers throughout the province.

1.2 Program Logic Model

Figure 1-1: Business Energy Rebates Program Logic Model



2 Program Description: Smart Lighting Choices

Smart Lighting Choices (SLC) is an upstream program that provides financial incentives to participating distributors for each unit of qualifying equipment sold for installation in non-residential facilities in Nova Scotia. The program focuses on 4-ft fluorescent High Performance (HP) T8 lighting (F32, F28 and F25 lamps and 347V ballasts) in both new installation and retrofit projects. Through the program, the DSM Administrator helps to offset the cost for commercial customers to upgrade from standard T12/T8 lighting to HP T8 lighting.⁴ The DSM Administrator expects legislation in Nova Scotia will be passed that will mandate that all T8 lighting sold in the province be High Performance T8 lighting. This legislation will render the SLC program superfluous; the program will be terminated once the legislation is enacted.

2.1 Program Theory

Program Background

The SLC program was designed to be a Market Transformation program with the objective of shifting the market for non-residential lighting in Nova Scotia to high performance lighting. By changing Nova Scotia's non-residential lighting market, the SLC program aims to help Nova Scotia businesses reduce their energy consumption and improve the quality of lighting in their buildings through the introduction of new, reliable and energy efficient technologies at a reduced cost.

Smart Lighting Choices provides financial incentives to participating distributors for each unit of qualifying equipment sold for installation in non-residential facilities in Nova Scotia, including commercial, institutional and industrial sectors. The program focuses on 4-ft fluorescent HP T8 lighting. This program was modeled on a similar program that was implemented by Efficiency New Brunswick.

Program Activities

The following are the key program activities:

- **Outreach to distributors.** Distributors sign agreements with the DSM Administrator requiring them to recognize and acknowledge the DSM Administrator and the SLC program in all materials, advertising and public events related to the SLC program and SLC associated projects.
- **Program Incentives.** The DSM Administrator provides incentives to participating distributors for sales of qualifying lighting products. The distributor retains a small transaction fee and passes the balance of the incentive to the buyer, in the form of a reduced price.
- **Program Marketing by Distributors.** Distributors market the program to electrical contractors and end users.

⁴ As of October of 2009, eligible products included HP T8F32 Lamps & Ballasts, HP T8F25 and F28 Lamps & Ballasts, and 347 Volt Ballasts. Incentives available to distributors were as follows: \$1.00 per lamp sold, \$3.25 per ballast sold.

Program Assumptions

The following assumptions underlie the program's process:

- **Availability of HP lighting products.** The distributors have access to sufficient quantities of the HP lighting products to meet customer demands.
- **Program incentives are passed on to end customers.** Because some HP lighting products are purchased and installed by electricians, the program cannot readily assure that the cost savings for the HP lighting products are being passed on to the end customers.
- **All HP lighting incentivized by program is installed.** Because some of the HP lighting products are purchased and installed by electricians, the program cannot always determine whether and where incentivized products have been installed.⁵

Program Barriers

- **Misplaced incentives.** The commercial real estate market places first-cost pressure on design professionals and equipment specifiers, biasing lighting decisions toward products with the lower first cost, regardless of life cycle energy costs.
- **Higher first cost.** HP lighting has a higher first cost than conventional lighting and first cost overshadows other influencing factors such as performance or life cycle cost.
- **Product availability/stocking.** Distributors are reluctant to stock HP lighting products if demand is uncertain and competition is largely driven by first costs.
- **Product lead time.** Design professionals and contractors are reluctant to use or specify HP lighting products that may require special ordering, resulting in longer product lead time, leading to delays and increased project costs.
- **Lack of information.** The lack of reliable information about the costs and savings from HP lighting is a major issue for professionals who are designing new buildings and for building managers who are seeking to replace lighting equipment.
- **Lack of experience with HP lighting.** Design professionals, building managers and electricians will be hesitant to specify or install a product with which they have little or no experience.
- **End users unaware that their new lighting is HP lighting and that it was incentivized by the DSM Administrator.** Because the program is targeted at distributors, not all end users will know that their new lighting is HP lighting and that the DSM Administrator provided the incentive on the HP lighting and, therefore, not specify HP lighting in the future.

⁵ While distributors are required to provide the address of larger retrofits or new construction projects that use program incentivized lighting, it is not practical for the program to verify that all program sales are installed. Smaller projects are more difficult to verify as distributors are not required to provide addresses for smaller projects.

Short-Term Outcomes

- All eligible distributors are enrolled into the program.
- Distributors become more active in the program and continue promoting the program independently.
- Sales of HP T8 lighting increase.
- HP lighting systems are installed.
- Electricians learn about HP lighting.

Mid-Term Outcomes

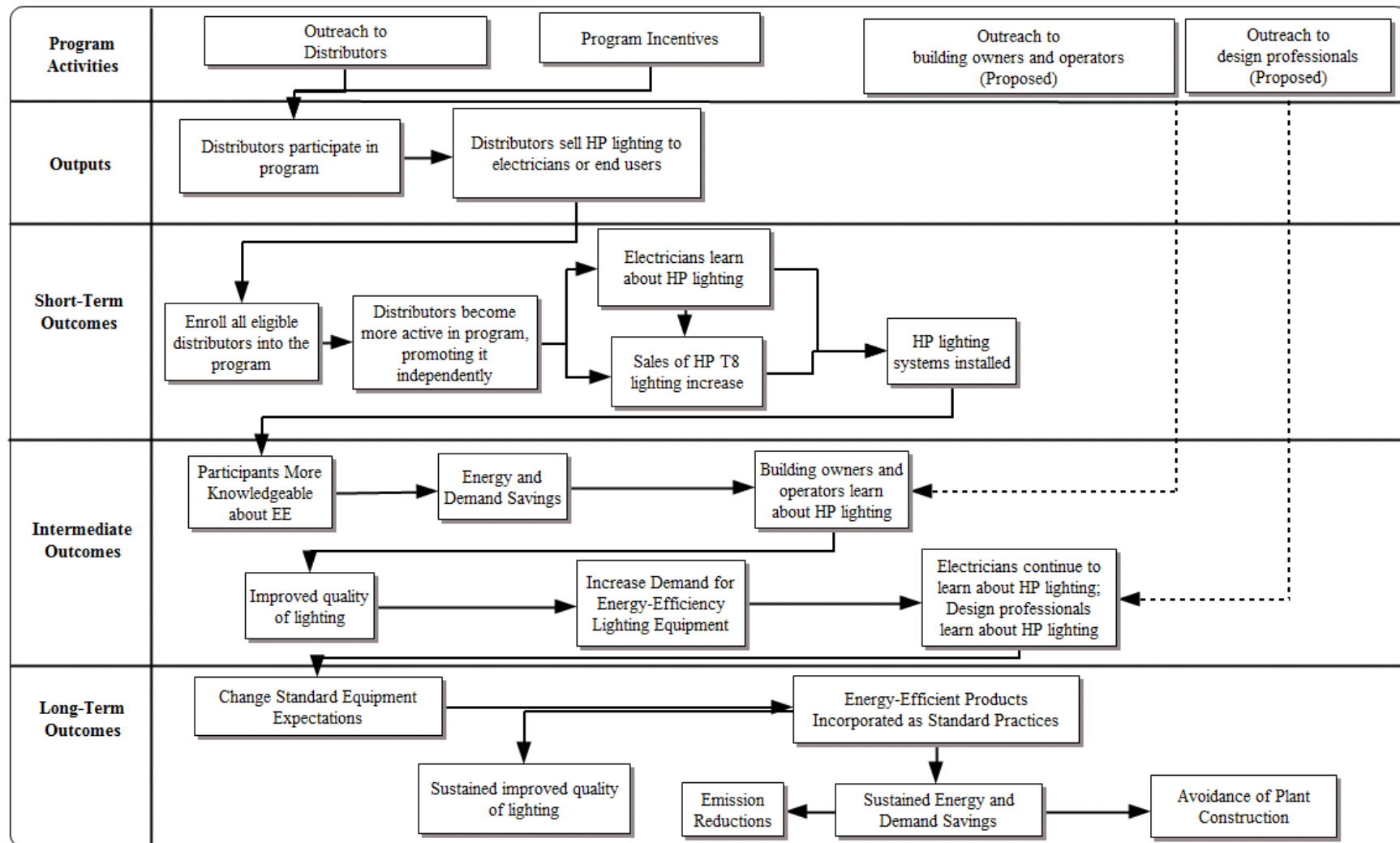
- Continued education of and engagement with electrical contractors, design professionals and lighting specifiers about HP lighting.
- Building owners and operators are educated about the value and benefits of HP lighting.
- Increased demand for HP lighting.
- Nova Scotia businesses that install HP lighting learn about and realize energy savings from HP lighting (from electricians and from savings on electric bills).
- Improved quality of lighting for Nova Scotia businesses that install HP lighting.
- Energy and demand savings for Nova Scotia Power.

Long-Term Outcomes

- Sustained energy savings for Nova Scotia businesses that install HP lighting.
- Sustained improved quality of lighting for Nova Scotia businesses that install HP lighting.
- Sustained energy and demand savings for the DSM Administrator.
- Designers, builders and architects specify high-performance lighting as standard practice.
- Electrical contractors install high-performance lighting as standard practice.
- End use customers request high-performance lighting.
- Distributors stock only high-performance lighting.
- Emission reductions.
- Avoidance of plant construction.

2.2 Program Logic Model

Figure 2-1: Smart Lighting Choices Program Logic Model



3 Impact Evaluation: BER

This section provides a discussion of the results for participants in the 2010 BER program. Results are divided into three primary sections: a review of the 2010 program population and our sampling approach, savings methodology, and the evaluated program impacts.

3.1 2010 Population and Program Activity

In 2010, there were a total of 13 sites with installations credited to the 2010 program year. Eight of these sites were retrofits and five were new applications. Rebated measures were nearly evenly divided among three primary measure types—HVAC, motors and drives, and lighting. The total savings associated with these measures was 791.8 MWh and 127.2 of connected kW. (Table 3-1)

Table 3-1: 2010 BER Population Tracking Summary

Project Type	# of Projects	Energy Savings (MWh)				Connected Demand Savings (kW)
		HVAC	Lighting	Motors	Total	
Retrofit	8	5.1	529.5	229.7	764.3	120.9
New Construction	5	3.3	5.8	18.4	27.5	6.3
Total	13	8.4	535.3	248.1	791.8	127.2

At the time of our sample design, ten sites had been completed and an eleventh site was in progress. The eleventh site was a particularly large lighting site. Since that time, two additional sites have been completed. As part of the impact evaluation, the NMR team visited eleven sites where work was completed or nearly completed. Sites were selected based on their relative energy savings and the various measures that had been installed or were soon to be installed. Table 3-2 contains a summary of the eleven sites visited, including the project number, type of equipment installed, and tracking connected demand and energy savings. Our on-site sample represented nearly one-third of the total 2010 tracked savings.

Table 3-2: 2010 BER Population Tracking Summary (Sample Frame)

Project #	Category	Tracking Energy Savings (MWh)	Tracking Connected Demand Savings (kW)
K-01	HVAC	2.1	1.2
K-02	HVAC	3.0	1.2
K-03	Motors and Drives	10.5	1.8
K-04	Motors and Drives	24.2	3.5
K-05	HVAC	2.8	1.0
K-06	Motors and Drives	7.9	1.3
K-07	Lighting	5.8	1.8
K-08	HVAC	0.6	0.4
K-09	Lighting	13.0	3.7
K-10	Lighting	0.6	0.2
K-11	Lighting	132.9	31.6
Total		203.4	47.7

At the conclusion of 2010, the NMR team received the final file of program activity. As noted earlier, there were two more sites that received rebates between when the sample was pulled and the end of the program year. One site was a lighting site and the other was a facility that had motors and drives installed. Because these two sites had the two highest savings among 2010 projects, the NMR team called them to further verify and refine their savings based upon information gathered over the phone. These sites are included in the section describing the results.

3.2 Savings Methodology

Evaluation activities included a review of documentation for each project and visits to each selected site. Site visits included interviews with customer contacts and DSM Administrator staff regarding the project and building operations. While on-site, the NMR team inspected installed equipment, collected nameplate data, verified measure quantities and types, and identified existing equipment and quantity where appropriate. While it was not always possible to verify all aspects of the project, each site visit collected the most accurate information available to inform the evaluated savings. The NMR team calculated savings based on the data collected on-site, program documentation, and secondary sources such as manufacturer websites, as required. The impact evaluation covered all three measure categories (lighting, motors and drives, and HVAC). This section provides an overview of the approach taken for each

measure type included in the sample. The evaluated savings used the most accurate information available; secondary sources and assumptions were employed only when needed. In our calculations, we included interactive effects when necessary and defined peak demand savings as winter non-holiday weekdays from 5:00 PM to 6:00 PM.

3.2.1 Lighting Savings Analysis

Lighting energy savings are achieved by replacing existing lighting with new lighting, which produces comparable lumen levels with less power. Additional energy savings may result from any interactive effects. Lighting in conditioned spaces will change electric heating and cooling system energy usage (typically resulting in additional cooling savings and/or a heating penalty).

The NMR team reviewed the formula used by the DSM Administrator to calculate lighting savings. This formula is briefly outlined below. Interactive effects were calculated for one of the sampled lighting sites and used a 1.17 factor to estimate a cooling credit for demand and 1.06 to estimate it for energy.

$$\text{Energy Savings}_{\text{ConnectedLoad}} = \left(\frac{(\text{QTY}_{\text{Pre}})(\text{P}_{\text{Pre}})(\text{Hours}_{\text{Pre}})}{1,000} \right) - \left(\frac{(\text{QTY}_{\text{Post}})(\text{P}_{\text{Post}})(\text{Hours}_{\text{Post}})}{1,000} \right)$$

$$\text{Peak Demand Savings}_{\text{ConnectedLoad}} = \frac{(\text{Energy Savings}_{\text{ConnectedLoad}})(\text{CF})}{1,000}$$

Where:

P_{Pre} = power of existing equipment, W.

P_{Post} = power of new equipment, W.

QTY_{Pre} = quantity of existing equipment, n.

QTY_{Post} = quantity of new equipment, n.

$\text{Hours}_{\text{Pre}}$ = annual operating hours of existing equipment, hr/yr.

$\text{Hours}_{\text{Post}}$ = annual operating hours of new equipment, hr/yr.

CF = peak coincidence factor, % as reported by site contacts.

1,000 is a conversion factor, W/kW.

The existing lighting was generally not available for inspection at the time of our site visits. However, in some instances, the same type of lighting had been used in other locations, in which case these pre-existing conditions were noted. Some projects also had spare equipment from the existing lighting available for inspection. For all other projects, the contact was able to describe the type and wattage of the existing lighting.

The type of lighting installed was verified on-site. Spare lamps and packaging were used to collect lamp wattages when possible. Linear fluorescent fixtures were verified to have electronic ballasts. For several projects, program documentation included manufacture specification sheets, which contained power ratings. Also, invoices included in the program documentation contained fixture and lamp make and model.

The quantity of lamps or fixtures installed was verified on-site through observation and through discussion with the site contact. The site contacts provided a description of the lighting schedule, including the use of the lighting between 5:00 PM and 6:00 PM during winter weekdays. Using these reported schedules, the annual operating hours and coincident factors were estimated for the installed lighting.

Data pertaining to interactive savings was also collected during the site visit. Among the sites visited, none had lighting installed in spaces with electric heating systems and two had lighting installed in air conditioned spaces. For the latter two projects, the interactive savings due to a reduced cooling load were calculated as follows:

$$\text{Energy Savings}_{\text{Cooling}} = \frac{(0.23)(\text{Energy Savings}_{\text{ConnectedLoad}})}{(\text{COP}_{\text{CoolingEquipment}})}$$

Where:

0.23 is the energy interaction between lighting and the cooling system.

COP_{Cooling System} = Coefficient of performance of the cooling system.

The type and rated capacity of cooling systems were collected during the inspection. Typical COP efficiencies for the appropriate type and size of the cooling system were applied. The total energy savings for lighting projects was the combination of the connected load energy savings and cooling interactive energy savings.

Lighting Results

A summary of lighting project impacts is provided in Table 3-3. At all lighting sites visited, the lamp and fixture types were consistent with program documentation. Sites K-07 and K-09 had the largest decreases in savings relative to tracking savings; the decreases were due to changes in the assumed hours of operation. The tracking savings estimates used a prescriptive annual operating hours of 3,500 hours per year for all projects. In these two instances, the hours of use went from 3,500 hours/year to 1,346 and 1,131 hours per year. The largest increase in savings (at site K-10) was caused by an increase in hours per year to 8,760. As described earlier, we contacted site K-13 by phone to assess its energy savings. We confirmed the technology and quantities installed in 2010 with the site contact and established that the conditions at the site were not appropriate for the calculation of interactive effects.

While operating hours were the primary source of savings changes, the calculation of interactive effects in the evaluated savings also caused our evaluated savings to change from that tracked in the program. Specifically, interactive effects increased savings at sites K-10 and K-11. After all adjustments were made for each site, the final estimate of total electric savings from lighting measures in this program was 514.9 MWh, which provided a realization rate of 104%. We estimated lighting Peak kW savings of 75.5.

Table 3-3: Lighting Savings Results

Project #	Tracking Savings (MWh)	Evaluated Savings	
		Energy (MWh)	Peak Demand (kW)
K-07	5.8	2.1	1.4
K-09	13.0	4.8	0.5
K-10	0.6	1.6	0.2
K-11	132.9	123.4	29.7
K-13*	383.0	383.0	43.7
Total	535.3	514.9	75.5

*Savings assessed over the phone

3.2.2 Motor and Drive Savings Analysis

All of the motors and drives in our sample were for the installation of variable frequency drives. Variable frequency drives adjust a motor's speed to meet the load, thereby reducing the motor's input power. Three of the four projects had unique operating conditions. For these projects, a prescriptive savings estimate based on the motor application was not appropriate. The other project was for the installation of VFDs on supply and return fans in a commercial building, and prescriptive savings were appropriate. For this project, the energy and demand savings used the same methodology as the tracking savings estimates:

$$\text{Energy Savings} = (\text{ESF})(\text{motor hp})(\text{CXS})$$

$$\text{Peak Demand Savings} = (\text{DSF})(\text{motor hp})(\text{CXS})$$

Where:

ESF=energy savings factor, kWh/hp.

Motor hp = rated power of the motor, hp.

CXS = Commissioning savings factor, %

DSF=energy savings factor, kW/hp.

For the three projects with unique operating conditions, savings were calculated using a load profile, hourly bin analysis. For both baseline and new motor drive systems, motor operating hours were allocated into percent flow bins. For each flow bin, the baseline and new motor input power was estimated. Energy and peak demand savings were calculated using the following equations:

$$\text{Energy Savings} = \sum_{\text{Flow}=0\%}^{100\%} (\text{Hours}_{\text{Pre, Flow}})(P_{\text{Pre, Flow}}) - (\text{Hours}_{\text{Post, Flow}})(P_{\text{Post, Flow}})$$

$$\text{Peak Demand Savings} = \sum_{\text{Flow}=0}^{100\%} (CF_{\text{Pre, Flow}})(P_{\text{Pre, Flow}}) - (CF_{\text{Post, Flow}})(P_{\text{Post, Flow}})$$

Where:

P_{pre} = input power of existing equipment for each flow bin, watts.

P_{post} = input power of new equipment for each flow bin, watts.

Hours_{Pre} = annual operating hours of the existing motor for each flow bin, hr/yr.

Hours_{Post} = annual operating hours of the new motor for each flow bin, hr/yr.

1,000 is a conversion factor, watts per kilowatt.

CF_{pre} = coincidence factor, the average percentage of time that the motor operates during the winter peak period for each flow bin.

For motors that were accessible, rated horsepower and nominal efficiency was collected from the motor's nameplate. For inaccessible motors, program documentation or the site contact provided the rated horsepower, and the efficiency was assumed to be 90%. It was assumed that all motors were properly sized and, therefore, operated at the rated power when operating under full load conditions. The rated power was used to calculate the full load power, as shown in the following equation:

$$P_{FullLoad} = \frac{(0.746)(Motorhp)}{(\eta_{motor})}$$

Where:

0.746 is a conversion factor, kW/hp

Motor hp = rated power of the motor, hp.

η_{motor} = nominal efficiency, %.

The input power for each flow bin was determined using an EPRI relationship of percentage full load versus percent air flow.⁶ The baseline input power depended on the existing systems control type. The baseline conditions were determined from staff interviews. All three of the sampled projects had constant speed motors with no flow control mechanism.

⁶ Electric Power Research Institute, Adjustable Speed Drives Directory, Table 3.1, p18, 1991

Table 3-4: Percent Flow versus Percent Full Load Power

Percent Flow (%)	Percent Full Load Power (%)			
	No Control	Inlet Guide Vanes	Discharge Damper	VFD
100	100	109	111	105
95	100	100	109	86
90	100	93	107	73
85	100	86	106	64
80	100	82	104	57
75	100	78	102	50
70	100	75	99	44
65	100	72	96	38
60	100	69	94	32
55	100	66	91	26
50	100	65	87	21
45	100	64	84	17
40	100	63	80	14
35	100	62	76	11
30	100	60	72	8
25	100	56	68	6
20	100	51	64	5

Each of the projects had unique operating conditions. Data collection was limited by control system software and the knowledge of the staff. Equipment schedules and load profiles were collected. For one project, the VFD software recorded several operating statistics which were used to determine the motor's load profile and schedule.

Motors and Drives Results

As mentioned, the VFD projects had unique operating conditions. Therefore, load profiles were developed for each motor in our on-site sample. The tracking savings estimates utilized a prescriptive savings approach, where savings were determined by a fixed savings factor (kWh/hp and kW/hp) depending on the motors application. This approach may be appropriate for specific HVAC applications that operate under typical conditions. However, the projects we visited on-site were all atypical.

Projects K-03 and K-06 were for VFDs on supply and exhaust systems, respectively. They were installed in an unconditioned air compressor room with a schedule similar to the air compressors. The air compressors were heavily loaded during the week and lightly loaded on weekends. The supply fan was not needed for most of the winter. It should be noted that a discrepancy was identified for project number K-03. The motor size reported by the program was 10 hp. However, the inspection revealed that a 5 hp motor had been installed. This error was probably made because the VFD was rated to control up to a 10 hp motor. The evaluated savings were higher than tracking savings because the evaluation found the baseline operating hours to be much higher than the program had estimated for one of the motors. With the installation of VFDs, the motors ran for less time and at a reduced load.

Project K-04 was for a condenser fan on a superheated ammonia refrigeration system. The refrigeration systems load was determined by an ice rink. The condenser fan was one of three fans, which had a poorly designed existing control system. Therefore, the existing and new hours were not equal. Condenser fans did not have a prescriptive savings value, so the tracking savings used an average of savings factors for several different applications. The savings for this site were higher primarily due to a significant increase in assumed baseline hours between the tracking system estimate and our on-site estimate. Savings were further increased due to the VFD reducing the hours more than had been assumed in the tracking system.

Project K-12 was for the installation of VFDs on supply and return fans in an office building. The motor speed was adjusted to meet static pressure set points. A total of 18 VFDs were verified to have been installed on motors ranging from 5 to 25 hp. The energy savings factor for supply and return fans were 1,001 kWh/hp and 1,524 kWh/hp, respectively. The demand savings factor for supply and return fans were 0.173 kW/hp and 0.263 kW/hp, respectively. The commissioning factor was 1.05, since the equipment was calibrated by an engineering firm.

Table 3-5: Motor and Drive Savings Results

Project #	Tracking Savings (MWh)	Evaluated Savings	
		Energy (MWh)	Peak Demand (kW)
K-03	10.5	40.5	0.0
K-04	24.2	78.9	11.0
K-16	7.9	20.3	1.2
K-12*	205.5	205.5	35.5
Total	248.1	345.2	47.7

*Savings assessed over the phone

3.2.3 HVAC Savings Analysis

Four HVAC projects were visited and evaluated. Each of these sites had new high efficiency air-source heat pumps installed. These heat pumps save energy by providing space conditioning at efficiencies higher than standard efficiency units.

The evaluation team reviewed the program's methodology. The approach was appropriate but a few adjustments were made between how the program had been determining savings and how we calculated it for our evaluation. These refinements were as follows:

- Heating and cooling capacities of the unit were used for heating and cooling savings, respectively, instead of only using the cooling capacity;
- SEER of the installed unit was used instead of the minimum qualifying SEER;
- HSPF of the installed unit was used instead of approximating the SEER of the minimum qualifying SEER multiplied by 0.65;
- Peak demand savings only included the reduction in heating load and the winter peak conscience factor.

The energy and demand savings were calculated in our evaluation using the following equations:

$$\text{Energy Savings}_C = (\text{QTY})(\text{Capacity}_C)(\text{EFLH}_C) \left(\frac{1}{1,000} \right) \left(\frac{1}{\text{SEER}_{\text{Pre}}} - \frac{1}{\text{SEER}_{\text{Post}}} \right)$$

$$\text{Energy Savings}_H = (\text{QTY})(\text{Capacity}_H)(\text{EFLH}_H) \left(\frac{1}{1,000} \right) \left(\frac{1}{\text{HSPF}_{\text{Pre}}} - \frac{1}{\text{HSPF}_{\text{Post}}} \right)$$

$$\text{Peak Demand Savings}_{\text{Winter}} = (\text{QTY})(\text{Capacity}_H)(\text{CF}) \left(\frac{1}{1,000} \right) \left(\frac{1}{\text{HSPF}_{\text{Pre}}} - \frac{1}{\text{HSPF}_{\text{Post}}} \right)$$

$$\text{Energy Savings} = \text{Energy Savings}_C + \text{Energy Savings}_H$$

Where:

QTY = quantity of units installed, n

Capacity_C = rated cooling capacity, BTU/hr

EFLH_C = Annual equivalent full load cooling hours, hr/ yr

SEER_{Pre} = Seasonal energy efficiency ratio of existing unit, BTU/W-hr

SEER_{Post} = Seasonal energy efficiency ratio of new unit, BTU/W-hr

Capacity_H = rated heating capacity, BTU/hr

EFLH_H = Annual equivalent full load heating hours, hr/ yr

HSPF_{Pre} = heating season performance ratio of existing unit, BTU/W-hr

HSPF_{Post} = heating season performance ratio of existing unit, BTU/W-hr

1,000 is a conversion factor, BTU/kBTU

CF = coincidence factor, the average percentage of total system power that is operating during the winter peak period

The make, model, and capacity were collected from nameplate data during the site visit. The efficiency of the new units was based on manufacturers' spec sheets that were included in the program documentation. The baseline SEER was 13, based on the program's baseline definition for units less than 65 kBTU/hr. A baseline HSPF was not provided by the program. Therefore, a baseline value of 7 HSPF was used, as this represented the lower end of standard efficiency unit available on the market.

Equivalent full load heating and cooling hours and the coincidence factor were based on the program's values. Full load heating and cooling hours were estimated at 2,000 hrs and 800 hrs, respectively. The winter coincidence factor for units less than 65 kBTU/hr was 57%.

HVAC Results

Two of the four HVAC evaluated savings estimates fell within 15% of one another. One of them (K-01) was around 60% higher. There were two primary reasons for the difference between tracking savings and evaluated savings for this site. First, the evaluated savings used 2,200 equivalent full load hours versus the 1,900 used in the tracking system. Second, the tracking system used the cooling capacity for both cooling and heating savings. In our analysis, we used both values to calculate savings (cooling capacity was 18,000 Btu/hr and heating was 21,600 Btu/hr). While these values are typically within 10% to 20% of each other, the impact on savings estimates was compounded by the unbalanced heating and cooling full load hours.

Site K-08 had the largest change in savings between tracking and evaluated. The primary driver of this discrepancy was that this site used the minimum of SEER 14 for the new equipment SEER. The other evaluated sites used the SEER of the actual equipment installed, which was much higher than the minimum used in Site K-08.

In the tracking system, cooling demand savings and heating demand savings were summed to get total demand savings. However, our evaluation was charged with determining peak demand savings, which only occurs during the heating season. Therefore, in our calculation of peak demand savings, only the heating demand savings was included. Our peak demand savings also incorporated a coincidence factor to account for average loads on equipment during the peak period.

As a result of our evaluation activities, the HVAC savings from this program were greater than that assumed in the tracking system. The tracked HVAC savings was 8,386 kWh, while our evaluated savings was 11,779 kWh, or a 140.5% realization rate.

Table 3-6: HVAC Savings Results

Project #	Tracking Savings (MWh)	Evaluated Savings	
		Energy (MWh)	Peak Demand (kW)
K-01	2.1	3.3	0.8
K-02	3.0	2.6	0.6
K-05	2.8	3.2	0.8
K-08	0.5	2.7	0.7
Total	8.4	11.8	2.9

3.3 Evaluated Program Impacts

Table 3-7 shows our final estimate of the BER program results. Results are shown by measure category at the meter and at the generator level compared with the tracking estimates. Since every site in the population was either visited or contacted as part of the evaluation, these results represent the entire population of 2010 participants. Our gross estimate of savings at the generator was 932.0 MWh and 134.8 kW in peak demand.

Table 3-7: Evaluated Program Savings

Measure Type	Tracking Savings (MWh)	Evaluated Savings at Meter		Evaluated Savings at Generator ⁷	
		Energy (kWh)	Peak Demand (kW)	Energy (MWh)	Peak Demand (kW)
Lighting	535.3	515.0	75.5	550.5	80.7
Motors and Drives	248.1	345.1	47.7	368.9	51.0
HVAC	8.4	11.8	2.9	12.6	3.1
Total	791.8	871.9	126.1	932.0	134.8

3.4 Spillover

NMR surveyed a total of eleven participants, the sample for the survey was drawn from participants who either completed or are in the process of implementing a project measure. However, for the spillover analysis, NMR limited the evaluation to just those six respondents whose projects were credited to the 2010 program year. Participants were asked about participant-like⁸ spillover, which is a situation in which a customer installed additional equipment of the same type as was installed through the program due to program influences. None of the participants reported any additional purchases or installations of the same types of measures as they had installed through the BER program. Based on this, the participant-like spillover rate for the BER program was zero. This was not unexpected given the various rebate programs available to business customers. Participants were likely to use the BER program or the C&I Custom program for any additional purchases or installations. It should be noted that BER participants were also asked about non-like spillover and none of the 2010 participants reported purchasing any additional measures after participation in the program. Additionally, in the in-depth interview, the BER program participant stated that, since the DSM Administrator had begun offering incentives for energy efficiency projects the participant had made every attempt to take advantage of rebates and incentives for all projects they implemented.

⁷ We used a factor of 1.069 to calculate the generator savings from the meter savings estimate.

⁸ Participant-like spillover is a conservative approach used to estimate spillover by asking participants about measures installed outside the program that are exactly the same type and efficiency as the ones installed through the program. Non-like spillover is based on asking participants about other energy efficient measures they had installed on their own and without assistance from another DSM program.

3.5 Free-ridership

For the free-ridership analysis, NMR limited the evaluation to just those respondents whose projects were credited to the 2010 program year. Six out of the eleven surveyed respondents had projects that were credited to the 2010 program year. In order to determine the extent of free-ridership, respondents were asked a series of questions related to their plans to pursue program measures before participating in the program, as well as the influence and importance of the program on their decisions to install program measures. The free-ridership questions were divided into three general categories: program influence, stated intent, and screening/cross-check questions. (Table 3-8, Table 3-9, and Table 3-10)

Table 3-8: Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
Now I would like to ask you to consider what actions you would have taken in the absence of the BER program. If your company / organization had not participated in the BER program, which of the following actions do you think you would have taken? Please select all that apply. Would you have...			
FR2a.	Postponed installing energy efficient equipment by more than one year	Yes No	0% 50%
FR2b.	Would not have installed any energy efficient equipment	Don't know	25%
FR2c.	Would have installed less energy efficient equipment	Yes No Don't know	See (i) 50% 25%
FR2ei.	[IF FR2e = YES] Would you have installed slightly, somewhat or significantly less energy efficient equipment?	Slightly Somewhat Significantly Don't know	25% 25% 0% 25%
FR2d.	Would have installed the same amount of energy efficient equipment that was installed through the program	Yes No Don't know	50% 25% 25%
Stated Intent Score = average of FR2a, FR2b, FR2c+ci, and FR2d.			

Table 3-9: Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following elements to your decision to participate in the BER program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to install the energy efficient equipment" and 5 indicates that the program was "extremely influential to your decision to install the energy efficient equipment." How influential was / were the:			
FR4a.	NSPI Incentive	1	50%
FR4b.	Installation contractor	2	37.5%
FR4c.	NSPI representative	3	25%
FR4d.	NSPI funded preliminary energy audit or scoping study	4	12.5%
FR4e.	NSPI funded feasibility study	5	0%
		Don't know	25%
Program Influence Score = maximum of FR4a, FR4b, FR4c, FR4d and FR4e.			

Table 3-10: Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Score
Screening			
FR1.	Did your organization have any specific plans to pursue [measure] prior to talking with anyone about the BER program?	Yes No plans Don't know	N/A
Budget Check			
FR3.	If your company had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the project including the incentive?	Yes No Don't know	N/A

Based on their responses to these questions, NMR divided respondents into three distinct groups:

- Full free-riders – those participants who would have installed the same energy efficiency measures in the absence of the program.
- Non-free-riders – those participants who would not have installed any of the energy efficient measures within one year of program participation.
- Partial free-riders – those participants who would have installed program measures within one year of program participation, but in smaller quantities or of lesser efficiency.

3.5.1 Full Free-riders

Respondents were identified as full free-riders, if they simultaneously met three criteria:

- They stated that their organization had had pre-existing specific plans to install energy efficient equipment prior to talking with anyone about the BER program:
FR1 = YES (see Table 3-10)

AND

- They said that their budget could have accommodated the full cost of installing the energy efficient equipment: FR3 = 0 (see Table 3-10)

AND

- They said that, in the absence of the BER program, they would have installed the same amount of energy efficient equipment that was installed through the program within one year:
FR2a = 1 and FR2d = 1 (see Table 3-8)

Among the six respondents, two were classified as full (100%) free-riders. According to the program records, these two respondents accounted for 59% of the total energy and 50% of the total demand savings for the sample of six respondents. In addition, according to the program records, these two respondents accounted for 25% of the total energy and 28% of the total demand savings for the population of 13 participants.

3.5.2 Non-Free-riders

Respondents were identified as non-free-riders, if they simultaneously met the following four criteria:

- They stated that their organization had no pre-existing plans to install energy efficient equipment prior to talking with anyone about the BER program:

FR1 = NO (see Table 3-10)

AND

- They said at least one program element had been ‘extremely’ influential to their decision to install energy efficient equipment:

Maximum value of FR4a, FR4b, FR4c, FR4d, FR4e = 5 (see Table 3-9)

AND

- They indicated that their budget would not have accommodated installing energy efficient equipment in the absence of the program:

Free-rider rate for FR2a, FR2b, and FR2ci = 0% (see Table 3-8)

AND

- They indicated they would have installed significantly less energy efficient equipment in the absence of the program:

Free-rider rate for FR2ci = Significantly less (see Table 3-8)

Among the six respondents, none were classified as non-free-riders (0%).

3.5.3 Partial Free-riders

Respondents not identified as either full free-riders or non-free-riders were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relies on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence, the results were then averaged to determine a final free-ridership rate.

Stated Intentions

In order to derive respondents' intentions, they were asked to consider what actions they would have taken in the absence of the BER program. Respondents were asked four questions as shown in Table 3-8. Based on their responses, each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 31.25%.

- FR2a = Yes (0%)
- FR2b = No (50%)
- FR2c = Yes; FR2ci = Somewhat (25%)
- FR2d = Yes (50%)

Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of five program elements on their decision to install energy efficient lighting on a scale of one to five, where one meant the program 'had no influence at all' on their decision and five meant that the program had been 'extremely influential' to their decision to install energy efficient equipment.

Impact of Budget

For respondents who had received a stated intentions free-ridership rate of 50%, a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project, no adjustments were made; if they said their budget could not have accommodated the project, their free-rider stated intent score was reduced to 25%.

3.5.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each participant, their free-rider stated intent score was averaged with their program influence free-rider score.

In 2010, based on the sample of respondents, it was not possible to weight respondents because two respondents accounted for over 50% of the total savings, which would have skewed the results. Based on this, NMR determined the total free-ridership level for the BER program to be 46%.

Table 3-11: Free-ridership

	2010	
	Demand	Energy
Sample size	6	6
Free-ridership rate	46%	46%

3.6 Net-to-Gross Ratio

For the BER program, the net-to-gross ratio was calculated based on spillover and free-ridership. For the 2010 program year, the net-to-gross ratio for the BER program was 54% for energy and demand savings.

3.7 Net Savings Estimation

Table 3-12 presents the net installed annual energy and demand savings for the 2010 BER program. The net annual savings were based on the original population tracking savings, the expanded savings estimates from the on-site observations, and the net-to-gross ratio derived from the participant survey. These estimates did not include the impact of projects that had been committed but not completed in 2010.

For the 2010 program year, the generator-level impacts were estimated at 503.3 MWh of energy savings and 0.72 MW of demand savings.

Table 3-12: 2010 Final BER Energy and Demand Savings Summary

Installed annual savings at generator	Evaluated Impact Savings Estimate	
	Energy (MWh)	Peak Demand (kW)
Gross savings	932.0	134.8
Net-to-gross ratio	54%	54%
Net savings	503.3	72.8

4 Impact Evaluation: SLC

The following impact evaluation of the 2010 SLC program includes an overview of the DSM Administrator-tracked program savings, a description of the methodology used to examine and verify program savings, and the program results.

4.1 Summary of DSM Administrator-Tracked 2010 Program Savings

The savings for the 2010 SLC program were calculated based on distributor-reported information on assumed wattages, assumed hours and bins of lighting types and quantities. Savings for the 2010 SLC program were based on monthly sales data provided by distributors to the DSM Administrator.

In 2010, there were 378,812 lamps and 115,808 ballasts rebated through the SLC program. Of these, 139,305 lamps and 49,398 ballasts were implemented through the Small Business Lighting Solutions (SBLS) and C&I Custom Program projects; these were removed from the total 2010 SLC Program sales presented in the table below. In 2010, approximately two of every three lamps sold through the program were F28 lamps and two of every three ballasts sold were two-lamp ballasts. (Table 4-1)

Table 4-1: SLC 2010 Program Sales

Equipment Type	Technology	Sales	
		Proportion ¹	Quantity
Lamps	F25	0.08%	191
	F32	34.10%	81,672
	F28	65.82%	157,644
	Total	100%	239,507
Ballasts	1-Lamp	5.72%	3,799
	2-Lamp	64.78%	43,020
	3-Lamp	6.02%	3,998
	4-Lamp	23.48%	15,593
	Total	100%	66,140

¹ The total percent does not sum to 100% because of rounding.

Table 4-2 shows the savings associated with the 66,140 ballasts and 239,507 lamps sold through the program. To determine the energy savings associated with these ballast sales, the DSM Administrator assumed that the baseline condition for ballast/bulb systems sold was T8 standard electronic ballasts. This assumption was based on the expectation that, for new construction projects, customers would only find T8 lamps and standard electronic ballasts at their distributor. However, this assumption was conservative to the extent that sales for retrofit projects may be replacing less efficient technologies such as T12 with magnetic ballasts. To determine how many of the ballasts sold used each lamp technology, the DSM Administrator applied the proportions of lamp technologies sold to each of the ballast technology quantities and used standard wattage reductions for each line item. For example, the savings estimate for ballasts with two T8F32 lamps was determined by taking the product of the proportion of lamps sold that were F32 (34.1%), the total 2-lamp ballasts sold (14,670), the watts reduced per ballast system (5) and the assumed hours per year (3,400).⁹ The estimated savings associated with 2-lamp T8F32 ballasts sold was, therefore, determined to be 249.4 MWh.

Table 4-2: Ballast and Bulb System Savings Summary

Replacing T12F34 Lamp System...	Ballasts	Lamps	Watts Reduced	Energy Savings (MWh)
... of 30 Watts with 1-Lamp...				
HPT8F32 (27 Watts)	1,295	1,295	3	13.2
HPT8F28 (24 Watts)	2,500	2,500	6	51.0
HPT8F25 (21 Watts)	3	3	9	0.1
...of 59 Watts with 2-Lamp...				
HPT8F32 (54 Watts)	14,670	29,340	5	249.4
HPT8F28 (47 Watts)	28,316	56,632	12	1,155.3
HPT8F25 (42 Watts)	34	69	17	2.0
...of 88 Watts with 3-Lamp...				
HPT8F32 (80 Watts)	1,363	4,090	8	37.1
HPT8F28 (71 Watts)	2,631	7,894	17	152.1
HPT8F25 (63 Watts)	3	10	25	0.3
...of 118 Watts with 4-Lamp...				
HPT8F32 (107 Watts)	5,317	21,269	11	198.9
HPT8F28 (94 Watts)	10,263	41,053	24	837.5
HPT8F25 (84 Watts)	12	50	34	1.4
Total	66,407	164,205	N/A	2,698.3

The baseline for lamps sold separately from ballasts was T8F32 fixtures with electronic ballasts. This assumed baseline was predicated on the belief that a customer purchasing lamps without ballasts likely had existing electronic ballasts in place and that, due to the cost of installing a high performance ballast, they would only change the lamps in the fixture. The reduction in watts for each lamp was assumed to be

⁹ The DSM Administrator's assumption of hours per year was derived from a combination of average annual operating hours by business type from the Vermont Technical Manual and weighted average operating hours measured as part of the SBLs and C&I Custom programs.

4 watts (from F32 to F28) with assumed annual hours of operation of 3,400. Multiplying the lamp sales remaining after accounting for those sales associated with ballasts ($239,507 - 164,205 = 75,302$ lamp only sales) by a 4-watt reduction per lamp and 3,400 hours of operation provided a savings estimate associated with lamp-only sales of 1,024 MWh. The total of the savings associated with ballasts and lamp systems and the savings associated with lamp-only sales in 2010 was, therefore, estimated to be 2,698 MWh plus 1,024 MWh, or 3,722 MWh at the meter.

4.2 Impact Evaluation Methodology

To perform an impact evaluation of this program, we followed the same analytical approach as the tracking system. That is, we built up energy savings from the application of installation rates, delta watts and hours of use for each lighting technology sold. To determine the impacts, we visited nine sites from the 2010 program year, spoke with four of the six primary distributors, and examined other sources of information to further inform our analysis. Included in the analysis was an examination of the 2009 evaluation, which included a total of 41 telephone surveys (30 electrical contractors and 11 end users).

4.2.1 Transaction Paper Audit

As part of the 2010 impact evaluation, the NMR team met with four of the six primary distributors participating in the 2010 SLC program. These four distributors accounted for over 91% of 2010 tracked energy savings. Visits to these four distributors were scheduled in order to verify that the distributors' sales records agreed with the information contained in DSM Administrator's tracking system. To perform this audit, the NMR team first acquired between five and 15 raw SLC sales transactions from each distributor. Next, these point of purchase transaction documents were compared with information from the tracking system to ensure consistency. For each transaction, the sales data provided by the distributors matched the sales information contained in the DSM Administrator's tracking system.

Once this review was completed, the NMR team compared the total distributor-recorded quantity and technologies sold to the spreadsheet that tracked and calculated the savings for the SLC program. These totals matched within reason, indicating that the quantities tracked matched the data provided on a monthly basis to program administrators by the distributors.

4.2.2 Installation Rates

At the nine sites visited, one site had not yet installed the lighting equipment purchased through the SLC program. This site had received the equipment but not yet put it into service. A second site had installed approximately 80% of the lighting purchased but had not yet installed the other 20% that were purchased and intended for that location. These 120 fixtures were not installed or otherwise observed at the site. Based on the nine site visits, the NMR team calculated a weighted installation rate of 89.8%. However, given the small sample upon which this was based, we reviewed the assumptions from the 2009 SLC study, which included 41 telephone surveys (30 electrical contractors and 11 end users). In 2009, the survey data revealed that approximately 96.3% of SLC program products had been installed. The relative convergence of these two values lent some credibility to our findings from 2010; however, we judged that a stronger estimate of 2010 installation rates would be obtained from combining the two results. Therefore, for the 2010 SLC evaluation we used the average estimate of a 93% installation rate.

4.2.3 Hours of Use

As part of the 2010 impact evaluation, the NMR team sought to inform the hours of use assumption based on the nine site visits. The nine sites included retail, warehouse, and hospital facilities. The operating hours assumption used in the tracking system was 3,400 hours per year, which was consistent with the average hours of use from the Vermont TRM and was also the weighted average of hours of use from the SBLIS program (2,880) and the C&I Custom program (4,801).

The operating hours for the retail and warehouse sites we visited were collected from the site contact and averaged 2,725 and 2,500 hours, respectively. Most of these facilities were open six days a week for approximately nine hours each day and could be characterized as small businesses. However, two sites were large hospitals whose operating hours were calculated separately for each unique area type within the hospital. For example, lighting in the corridors and stairwells was in operation 8,760 hours a year whereas the lighting in the administration areas was in operation for 3,285 hours a year. A weighted average of new lamps installed by area type yielded an average of 5,206 hours. The mean hours of use across the retail, warehouse, and hospital building types was 3,477 hours per year.

Although the sample size was too small to arrive at a statistically valid conclusion for the population as a whole, the information collected was compared with the program assumptions. There was no significant difference between the program assumption of 3,400 hours per year and the hours of use calculated from the site visits. In addition, for the 2009 evaluation, NMR used phone surveys to estimate hours of operation. The annual hours of use reported in the telephone survey were 4,514 hours per year, approximately 33% higher than those assumed by the program and observed during the 2010 evaluation. The NMR team also examined other resources to determine estimates of average annual lighting hours. In particular, the current Connecticut Program Savings Document provided an average lighting hours of use across all building types of 3,994, while the 2011 Massachusetts Technical Reference Manual provided an average lighting hours of use of 4,656.^{10,11} Based on these findings, we believe that the use of 3,400 annual operating hours used in the gross savings analysis, can be considered conservative.

4.2.4 Interactive Effects

For the 2010 evaluation, the NMR team sought to estimate the impact of interactive effects for the SLC program. In the context of energy savings analysis, the term “interactive effect” refers to a related change in another devices’ electrical use, as influenced by the implementation of an energy conservation measure on a given piece of equipment. The term typically refers to the interaction between a measure installation and the local heating and cooling systems as reductions in electrical energy use within a conditioned space naturally result in reduced heat gains to the space. In conditioned spaces, this reduced heat gain translates into lower cooling load and higher heating load, which would then be compensated for by the facility HVAC systems.

While on-site, evaluators assessed whether areas with lighting were served by electric heating or cooling systems and the types of systems used in those areas. Table 4-3 presents information gathered during the site visits. In addition to the nine site visits completed in 2010 for the SLC program, we have included

¹⁰ <http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/c530ebcb3a3e701f852577af005d20e6?OpenDocument>

¹¹ http://www.ma-eeac.org/docs/MA%20TRM_2011%20PLAN%20VERSION.PDF

information collected during site visits for the following DSM Administrator program evaluations: the 2008 SBLs evaluation, 2009 and 2010 C&I Custom evaluation, and the 2010 Efficient Products Direct Install evaluation. Note that the C&I Custom and the SBLs programs used lighting from the SLC program but were netted out of the program savings by the DSM Administrator. Based on data collected from site visits for each program we calculated a weighted average of fixtures installed in electrically cooled (58.6%) and electrically heated spaces (19.1%). In addition, as shown in Table 4-4, we calculated weighted average cooling COPs and electric heating efficiencies from the same data sources

Table 4-3: Lighting in Electrically Conditioned Spaces

Program	Year	Fixtures in Sample	% Lighting in Electrically Cooled Spaces	% Lighting in Electrically Heated Spaces
Smart Lighting Choices	2010	4,717	97%	2%
Small Business Lighting Solutions	2008	6,759	19%	8%
Efficient Products - Direct Install	2010	2,159	48%	4%
C&I Custom	2009 and 2010	14,644	66%	32%
Weighted Average	N/A	24,724	58.6%	19.1%

Table 4-4: HVAC Efficiencies

Program	Year	Fixtures in Cooling Sample	Electric Cooling COP	Fixtures in Heating Sample	Electric Heating Efficiency
Smart Lighting Choices	2010	4,586	1.9	88	1.0
Small Business Lighting Solutions	2008	1,266	2.6	504	1.1
Efficient Products - Direct Install	2010	1,032	2.7	80	3.37*
C&I Custom	2009 and 2010	9,722	2.9	4,722	1.0
Weighted Average	N/A		2.6		1.0

*Air-to-air heat pump only

The cooling savings and heating penalty were calculated using the difference in connected kW between installed and baseline fixtures. The cooling and heating equations are presented below.

Interactive Cooling Formula:

$$\frac{(average\ kW \times summer\ waste\ heat\ factor \times \%fixtures \times (hours\ per\ year \times \%coincident\ cooling))}{Average\ COP}$$

Where,

- Average kW is the total average kW of all installed fixtures in the project.
- Summer waste heat factor is the percent of the total power that is converted to waste heat.
- % fixtures is the total number of fixtures in air conditioned and refrigerated spaces.
- Hours per year is the average annual operation of all fixtures installed.
- % coincident cooling is the percentage of total annual lighting hours that the cooling equipment operates.

- Average COP is the average coefficient of Performance or efficiency of the cooling equipment (as provided in Table 4-4).

Interactive Heating Formula:

$$\frac{(average\ kW \times winter\ waste\ heat\ factor \times \%fixtures \times (hours\ per\ year \times \%coincident\ heating))}{Average\ COP}$$

Where,

- Average kW is the total average kW of all installed fixtures in the project. This number is presented as a negative to indicate loss and not savings.
- Winter waste heat factor is the percent of the total power that is converted to waste heat. This value is slightly smaller than the summer percentage. There are times when internal gains, solar gains, faulty HVAC equipment, or other reasons when space temperatures exceed thermostat set points. The waste heat does not reduce temperatures at these times and there is no additional operation of the heating equipment.
- % fixtures is the total number of fixtures in heated spaces.
- Hours per year is the average annual operation of all fixtures installed.
- % coincident heating is the percentage of total annual lighting hours that the heating equipment is enabled. This value is taken from the project spreadsheets.
- Average efficiency is the average efficiency of the heating equipment.

4.3 Program Impact Results

Table 4-5 presents the final estimates of savings for the SLC program based upon the analyses described above. This table includes the original 2010 population tracking savings at the meter and generator and the subsequent estimate of 2010 impacts from this evaluation. At the program level, the 2010 installed annual energy savings for the SLC program was determined to be 6,922.1 MWh at the meter and 7,434.5 MWh at the generator, using a line loss factor of 1.074.

The 2009 telephone survey interviewees reported that, on average, 64.9% of program lighting products operated from 5pm to 6pm. In the absence of a stronger indicator of peak performance, we used this value for the 2010 impact evaluation. The SLC program's connected and peak demand savings at the meter were 2,040.0 kW and 1,324.0 kW, respectively. At the generator, the connected demand savings were 2,191.0 kW, while the peak demand savings were 1,422.0 kW.

Table 4-5: Gross SLC Savings Summary

Savings Type	DSM Administrator Tracking Estimate (MWh)		Evaluated Impact Savings Estimate (MWh)	
	Meter	Generator	Meter	Generator
Lamps	1,024.1	1,099.9	1,382.4	1,484.7
Systems	2,698.2	2,897.9	5,569.1	5,981.2
Interactive Effects	N/A	N/A	-29.4	-31.4
Total Energy Savings (MWh)	3,722.3	3,997.8	6,922.1	7,434.5
Connected Demand Savings (kW)	1,090.0	1,170.6	2,040.0	2,191.0
Peak Demand Savings (kW)	707.4	759.7	1,324.0	1,422.0

4.4 Free-ridership

For the 2010 SLC evaluation, the NMR team relied on the findings of the 2009 SLC evaluation for estimates of free-ridership and spillover. In 2009, in order to determine the extent of free-ridership, NMR had asked distributors a series of questions related to the impact of the program on purchasing decisions of electrical contractors and end users. Similarly, NMR asked end users and electrical contractors a series of questions related to their willingness (or their customers' willingness) to pay 15% to 30% more for their recently-installed HP T8 lighting systems. Based on these responses, we estimated a free-ridership value of 16%. In 2009, NMR estimated that the SLC program had resulted in no spillover.

4.5 Net Savings Estimation

Table 4-6 presents the net installed annual energy and demand savings for the 2010 SLC program. For the 2010 program year, the generator-level impacts were estimated at 6,245.0 MWh of energy savings and 1,194.5 kW of demand savings.

Table 4-6: 2010 Final SLC Energy and Demand Savings Summary

Installed annual savings at generator	Evaluated Impact Savings Estimate at Generator	
	Energy (MWh)	Peak Demand (kW)
Gross savings	7,434.5	1,422.0
Net-to-gross ratio	84%	84%
Net savings	6,245.0	1,194.5

5 Process Evaluation

5.1 Methodology

The process evaluation of the 2010 BER program relied upon in-depth interviews conducted with program staff, one program participant, as well as a telephone survey of program participants. Copies of the interview guides are included in Appendix A of this report.

5.1.1 In-depth Interviews

NMR staff conducted an in-depth interview in July of 2010 with the BER program manager. The interview covered a variety of program-related topics including program goals, program theory, delivery, and perceived successes and challenges. NMR drew upon the insights gained in this in-depth interview to develop the participant survey instrument and the in-depth interview guide.

5.1.2 Telephone Survey and Sample Design

NMR completed telephone surveys with a total of eleven program participants. It is important to note that the BER program launched in 2010 and it had relatively few participants (13). In order to increase the number of participants available for the process evaluation, NMR included 17 participants to the telephone survey sample whose projects had not been completed as of the end of the 2010 program year. The survey was conducted by NMR's subcontractor, Interviewing Services of America, out of its offices in Halifax, NS. The interviews were conducted between August 2010 and January 2011, utilizing computer-assisted telephone interviewing (CATI). The sample of participants was provided by the DSM Administrator from its program tracking database which, as of January 2011, included 30 participants.

5.1.3 Sampling Error

Table 5-1 shows the estimated population, sample size and associated sampling error at the 90% confidence level for the telephone surveys.

Table 5-1: Sample Size and Sampling Error

	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
Participants 2010	30	11	$\pm 20.1\%$

5.2 Program Goals and Design

The Business Energy Rebate (BER) program was a new addition to the DSM Administrator's portfolio of energy efficiency programs, implemented in mid-2010. The BER program provided financial incentives, through prescriptive rebates, to businesses for the purchase of qualified energy efficient equipment. Eligible product categories included lighting, motors and drives, HVAC, refrigeration and compressed air equipment.

The BER program was developed in-house by DSM Administrator staff and modeled closely after successful prescriptive programs offered in other markets, specifically Efficiency Vermont (EVT). The technologies targeted for the initial launch were recommended by EVT as offering the greatest potential

for early uptake. EVT further assisted by providing eligibility criteria, savings estimates and approved product lists.

The goals of the BER program as outlined in the program manual were:

- To raise customer awareness of options in efficient products.
- To encourage the use of efficient products in the design of new facilities and retrofits.
- To increase the market penetration of the supported technologies.
- To eventually transform the market by raising the efficiency of standard practices.

5.3 Outreach and Marketing

Direct marketing for the BER program was performed by the C&I Sales Lead, through a marketing subcontractor, Delivery Agents, and an outbound calling center. In addition, the program was advertised in newspapers and on the DSM Administrator's website.

5.4 Measure Installations

Respondents to the participant survey were asked whether they recalled installing the type of equipment indicated by the program files. Four of the eleven respondents verified that they had installed energy efficient lighting through the BER program, three verified that they had installed HVAC equipment, and two verified that they had installed new motors or variable speed drives. Two respondents did not recall installing the equipment indicated by the program files although both verified that they had participated in the program. (Table 5-2)

Table 5-2: Product installation connected to BER

Type of Product Installed	2010
<i>Sample Size</i>	<i>11</i>
Lighting	4
HVAC equipment/upgrades	3
New motors or variable speed drives	2
Unknown*	2

* Two respondents did not recall installing the equipment recorded as installed in program files. As a result of this discrepancy, these respondents were not asked many of the subsequent questions.

Nearly one-half of the respondents (5 out of 11) said that the person most responsible for specifying equipment to install in their business was a contractor. Two respondents cited an outside design professional, another two cited a utility account manager, and one cited a manufacturer representative as the person most responsible. Only one respondent said that someone within their company was responsible for choosing equipment to install. (Table 5-3)

Table 5-3: Responsibility for Specifying Measures to Install Through BER

Person Responsible	2010
<i>Sample size</i>	<i>11</i>
Contractor	5
Outside design professional	2
Utility account manager	2
Manufacturer representative	1
Someone within their company/organization	1

5.5 Program Awareness, Motivation and Barriers

When asked how they had first become aware of the BER program, four out of eleven respondents cited sources associated with NSPI, the interim DSM Administrator. In addition, three respondents cited a contractor or vendor, one had learned of the program through an electronic trade newsletter, and another cited a previous participant. These sources were consistent with the marketing methods utilized by the BER program. (Table 5-4)

Table 5-4: Source of First Awareness of BER program

Source	2010
<i>Sample size</i>	<i>11</i>
NSPI literature	1
NSPI presentation	1
NSPI staff	2
Contractor or vendor	3
Trade newsletter (emailed)	1
Previous participant	1
Other	1
Don't Know	1

Respondents participated in the program for a variety of reasons. The most frequently cited reason was to save on energy costs, with six respondents citing this as their most important motivation and three citing it as their second most important motivation. Two respondents mentioned that participation was an easy process, and three cited helping the environment and/or energy conservation as important motivations. Only three respondents cited the program incentives as an important motivation, and it was not the most important motivation for any of the respondents. (Table 5-5)

Table 5-5: Reasons for Participating

Motivations	2010	
	Most Important Motivation	Second Most Important Motivation
<i>Sample size</i>	<i>11</i>	<i>11</i>
Save on energy costs/bills	6	3
It was an easy process	1	1
For the environment	1	1
Already planning project	1	--
Energy conservation	1	--
Already pay into the program	1	--
Take advantage of program incentives	--	3
Improve existing lighting conditions	--	2
Don't know	--	1

Respondents were also asked why they had decided to install energy efficient equipment. Table 5-6 shows respondents' most and second most important motivations by type of equipment installed.

Saving on energy bills was the most frequently cited reason for installing energy efficient equipment. Three out of the four respondents who had installed energy efficient lighting, both respondents who had installed new motors/variable speed drives, and all three who had installed HVAC equipment reported this as their most important motivation.

Other motivations for respondents who had installed lighting included improving lighting conditions (cited by two respondents) and taking advantage of program incentives (cited by one respondent). Other motivations for respondents who had installed HVAC equipment included reducing maintenance costs, taking advantage of program incentives, and reducing their carbon footprint.

Table 5-6: Importance of Motivations for Product Installation

Motivations	Lighting		New motors or variable speed drives		HVAC equipment/ upgrades		All Measures	
	Most Imp.	2 nd Most Imp.	Most Imp.	2 nd Most Imp.	Most Imp.	2 nd Most Imp.	Most Imp.	2 nd Most Imp.
<i>Sample size</i>	4	4	2	3	3	2	9	9
Save on energy costs/bills	3	--	2	3	--	--	5	3
Reduce carbon footprint	--	--	--	--	2	--	2	--
Improve existing lighting conditions	1	1	--	--	--	--	1	1
Expanding, needed new equipment	--	--	--	--	1	--	1	--
Take advantage of program incentives	--	1	--	--	--	1	--	2
Reduce maintenance costs	--	--	--	--	--	1	--	1
Don't know/Refused	--	2	--	--	--	--	--	2

Nearly all of the respondents (ten out of eleven) reported that they had experienced no barriers to participating in the BER program. The one respondent who had reported facing a barrier said that it had taken too long to find out if they were eligible to participate. (Table 5-7)

Table 5-7: Barriers Faced During Program Participation

Faced any Barriers	2010
<i>Sample size</i>	<i>11</i>
No	10
Yes	1

5.6 Free-ridership and Spillover

Respondents were asked several questions about their intentions to install energy efficient equipment prior to hearing about the program and what they would have installed in the absence of the program. The responses to these questions were used to determine respondents' free-ridership status. In addition, respondents were asked about any energy efficient actions taken since participating in the program and the extent to which the BER program had influenced them to take these actions.

5.6.1 Free-ridership

Respondents were asked whether, prior to talking with anyone about the BER program, they had had any specific plans to install upgrades of the type that they had installed through the program (i.e., lighting, new motors or variable speed drives, or HVAC equipment). As shown in Table 5-8, out of the four respondents who had installed lighting through the program, three said they had had prior plans to do so. Both of the respondents who had installed motors or variable speed drives and two of the three respondents who had installed HVAC equipment also reported having had prior upgrade installation plans. Overall, seven out of the nine respondents who were asked the question reported having had specific plans to install these upgrades prior to hearing about the program.

Table 5-8: Prior Plans to Install Upgrades

Plans	Lighting	New motors or variable speed drives	HVAC equipment/ upgrades	All Measures
<i>Sample size</i>	<i>4</i>	<i>2</i>	<i>3</i>	<i>9</i>
Yes	3	2	2	7
No	1	0	1	2

Respondents were asked four questions about actions they would have taken in the absence of the BER program. (Table 5-9) As the questions were asked separately, respondents were not required to choose only one option; rather, they responded to each option with “yes” or “no.” Three of the nine respondents who were asked these questions said they would have postponed installation for more than a year, three said they would not have installed any equipment, five said they would have installed less energy efficient equipment, and three said they would have installed the same quantity of equipment as had been installed through the program.

Table 5-9: Installation of Energy Efficient Measures without BER Program

Measures	n	2010		
		Yes	No	Don't know
Postponed installation for more than one year	9	3	6	--
No equipment installation	9	3	6	--
Installing less energy efficient equipment	9	5	4	--
Installing the same quantity of equipment	9	3	5	1

Eight out of the nine respondents indicated that their budget could have accommodated the equipment that had been installed in the absence of the program rebates. (Table 5-10)

Table 5-10: Budget Capabilities without Program

	Lighting	New motors or variable speed drives	HVAC equipment/ upgrades	All Measures
Sample size (n)	4	2	3	9
Yes	3	2	3	8
No	--	--	--	--
Don't know	1	--	--	1

Respondents rated the influence of various aspects of the BER program on their decision to participate in the program on a scale from one (“not at all influential”) to five (“very influential”). Information, services, or advice from a contractor as well as NSPI representatives were the most influential aspects; each received four ratings of five and three ratings of four. Information or advice from the program and the rebates were only moderately influential. (Table 5-11)

Table 5-11: Influence of Program Elements on BER Participation

Program Element	n	Rating: 5= ‘very influential’ and 1 = ‘not at all influential’				
		5	4	3	2	1
Information, advice or services provided by a contractor	9	4	3	1	--	1
NSPI Representative	9	4	3	1	--	1
Information or advice received from the program	9	2	2	2	2	1
NSPI incentive or rebates	9	1	1	3	1	3

5.6.2 Spillover

When respondents were asked whether they had installed any additional equipment of the type they had installed through the BER program (i.e., additional lighting equipment, new motors/variable speed drives, or HVAC equipment), all nine said that they had not done so. (Table 5-12)

Table 5-12: Post-Program Energy Efficiency Installations

Any Additional Measures	Lighting	New motors or variable speed drives	HVAC equipment/ upgrades	All Measures
<i>Sample size (n)</i>	4	2	3	9
Yes	--	--	--	--
No	4	2	3	9

Respondents were then asked whether the program had influenced them to take any other energy efficiency actions. (Table 5-13) Three out of the eleven respondents to this question had been influenced to take additional actions including installing HVAC upgrades, energy efficient lighting, and occupancy sensors.¹²

Table 5-13: Influence of Program on Additional Energy Efficiency Actions

Program Influenced Additional Actions	2010
<i>Sample size (n)</i>	11
No	8
Yes	3
Type of Action Taken (Multiple Response)	2010
<i>Sample size (n)</i>	3
HVAC	1
Lighting	1
Occupancy sensors	1

¹² The three respondents who reported having taken additional actions did not have their projects completed as of 2010. These respondents were included in the 2010 process evaluation and excluded from the 2010 impact evaluation.

5.7 Energy Attitudes and Importance

As shown in Table 5-14, all of the respondents indicated that managing energy was important to their business. On a scale from one (“not at all important”) to five (“very important”), reducing usage and managing costs each received ten importance ratings of five and one rating of four.

Table 5-14: Importance of Energy Management

Importance of	<i>n</i>	Rating: 5= ‘very important’ and 1 = ‘not at all important’				
		5	4	3	2	1
Reducing energy usage	11	10	1	--	--	--
Managing energy costs	11	10	1	--	--	--

Respondents were asked to estimate their energy costs as a percent of their annual budget. Of the seven respondents who were able to provide an estimate, six said that it was less than 30% of their budget—five said it was less than 20% of their budget and two said it was less than 10% of their budget. One respondent, whose business’ primary activity was public assembly, said that their energy expenses were a far greater proportion of their operating costs with energy costs making up 60% of their total budget. (Table 5-15)

Table 5-15: Energy Costs as a Percent of Annual Operating Budget

Percent of Budget	2010
<i>Sample size (n)</i>	11
Less than 10%	2
10-19%	3
20-29%	1
30-39%	0
40-49%	0
50-59%	0
60-69%	1
70-99%	0
Don’t Know	4
Average Percent	17%

5.8 Satisfaction and Program Improvement Suggestions

The majority of respondents were satisfied with the program. On a scale from one (“not at all satisfied”) to five (“very satisfied”), eight out of the eleven respondents gave a rating of four or five to the program overall, while the other three respondents gave the program a rating of three.

The various aspects of the program each received ratings of four or five from the majority of respondents, with the exception of rebate amounts. Respondents were least satisfied with the rebate amounts; five of eleven respondents gave rebate amounts a rating of four or five, three respondents rated it a one or two, and three gave rebate amounts a middle rating of three. (Table 5-16) In an in-depth interview with a BER participant, the participant said, *“The challenge with [the BER program is that] the program is fairly new. Some of the rebates don’t accurately depict or give you enough incentives to implement the application or the product.”* He went on to use LED parking lot lighting as an example, saying, *“We would love to do that; however, the \$100 rebate doesn’t even come anywhere close to compensating us for the 100% up-charge in the product. It would need to be in the \$300 to \$400 range.”* The need to make adjustments in incentives was not an unexpected obstacle in the inaugural year of a new program. During an in-depth interview, conducted shortly after the program launched, the program manager identified incentives as a potential obstacle for the 2010 program year and said that incentive levels may require adjustments over-time based on feedback from participants and other factors.

Table 5-16: Satisfaction with BER Program

Aspect of program	n	Rating: 5= ‘very satisfied’ and 1 = ‘not at all satisfied’						
		5	4	3	2	1	DK	NA
Program overall	11	3	5	3	--	--	--	--
Program application, forms and paperwork	11	3	3	4	1	--	--	--
Interaction and communication with staff	11	6	1	2	--	--	--	2
Availability of NSP staff	11	6	2	2	--	--	--	1
Initial confirmation of eligibility	11	4	2	3	1	--	1	--
Rebate or incentive amounts	11	3	2	3	2	1	--	--
Time required to receive rebate or incentive	11	3	4	--	--	1	3	--

As shown in Table 5-17, nearly all of the respondents said they were likely to purchase energy efficient products in the future, with ten out of eleven giving a likelihood rating of four or five on a scale from one (“not at all likely”) to five (“very likely”).

Table 5-17: Likelihood of Purchasing Energy Efficient Products in the Future

	n	Rating: 5= ‘very likely’ and 1 = ‘not at all likely’				
		5	4	3	2	1
Likelihood of energy efficient upgrades when replacing equipment in the future	11	8	2	1	--	--

Seven of the eleven respondents gave suggestions for improving the program. Three respondents suggested that the program increase the rebate amounts, reinforcing the earlier finding that respondents were least satisfied with this aspect of the program. Other suggestions included ways to make the process easier, clearly indicating the products that are eligible for rebates, making forms more user-friendly, and establishing more direct contact between the customer and the program staff. In the in-depth interviews, a program participant suggested that program staff more carefully review the full costs of equipment before assigning incentive values to ensure that the rebate offered covers a substantial portion of the capital cost.

Table 5-18: Recommendations to Improve Program

	2010
<i>Sample size (n)</i>	11
Increase rebates	3
Keep focus on retrofits	1
Clarify what products are eligible for rebates	1
Make forms more user-friendly	1
More direct contact between customer and program staff	1
None	4

5.9 Firmographics

The respondents represented a diverse variety of business types. (Table 5-19)

Table 5-19: Principal Building Activity

	2010
<i>Sample size (n)</i>	11
Retail (Other than Mall)	2
Retail (Enclosed and Strip Malls)	1
Food Processing	1
Office	1
Public Assembly	1
Automotive Repair	1
Religious Worship	1
Commercial Property Services	1
Forestry	1

Concomitantly, there was a wide range of building floor space reported by the respondents. Two out of eleven respondents reported having facilities with less than 5,000 square feet of floor space, two reported having facilities with over 100,000 square feet, and six reported intermediate ranges of floor space. (Table 5-20)

Table 5-20: Building Floor Space

Square meters/Square feet	2010
<i>Sample size (n)</i>	<i>11</i>
93 or less (1,000 or less)	0
93 to 463 (1,000 to 4,999)	2
464 to 929 (5,000 to 9,999)	3
930 to 4,645 (10,000 to 49,999)	2
4,646 to 9,290 (50,000 to 99,999)	1
Over 9,290 (Over 100,000)	2
Don't know	1

The number of employees also varied widely among respondents. Three respondents reported having fewer than 10 employees, two respondents reported having 100 or more employees, and six reported having an intermediate number of employees. (Table 5-21)

Table 5-21: Full-time Equivalent Workers

	2010
<i>Sample size (n)</i>	<i>11</i>
Fewer than 5	2
5 to 9	1
10 to 19	3
20 to 49	2
50 to 99	1
100 to 249	1
250 or more	1

The majority of respondents (8 out of 11) reported that their businesses operated between 40 and 79 hours per week, with 68 being the average number of operating hours. (Table 5-22)

Table 5-22: Hours of Operation

Hours per week	2010
<i>Sample size (n)</i>	<i>11</i>
Less than 40	1
40 to 79	8
80 to 119	1
120 or more	1
Average hours	68

Eight out of eleven respondents reported that their businesses were independent and not part of a larger company. (Table 5-23)

Table 5-23: Type of Company

	2010
<i>Sample size (n)</i>	<i>11</i>
Independent	8
Part of a larger company	3

Out of the nine respondents who reported the number of other facilities their businesses had in Nova Scotia, five reported no other facilities and four reported between one and five other facilities. (Table 5-24)

Table 5-24: Number of Other Facilities in Nova Scotia

	2010
<i>Sample size (n)</i>	<i>11</i>
Zero	5
1-5	4
Don't Know	2
Average*	2

*Only companies with at least one other facility in N.S. were included in the average.

Appendix A Interview Guides



Participant Survey 2009-10 NSPI Business Energy Rebate Program DRAFT 8-6-10

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 NMR Group, and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm recently participated in Nova Scotia Power's Business Energy Rebate program. We would appreciate fifteen minutes of your time to answer some questions related to your participation in this program, the information you provide will be used to help Nova Scotia Power evaluate and improve the program. Is this a good time for you?

Verification and Recall

V1. Our records indicate that your company / organization participated in Nova Scotia Power's Business Energy Rebate program. Is this correct?

1. Yes (Go TO V3)
2. No

V2. Is there someone else at your company / organization who would know about your company / organization's participation in Nova Scotia Power's Business Energy Rebate 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 / organization who is most knowledgeable about your experience with the Business Energy Rebate 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 Business Energy Rebate 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]

Now I would like to ask you some general questions about the Business Energy Rebate program.

P1. Did your company / organization participate in any Nova Scotia Power energy efficiency programs before the Business Energy Rebate program?

1. Yes
2. No (go to P4)

P2. [IF P1 = 1] Which programs did your company / organization participate in prior to the Business Energy Rebate program?

- 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 / organization participate in [program].

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
98. (Don't know)
99. (Refused)

P4. How did you first learn about the Business Energy Rebate program? [RANDOMIZE AND READ 1-7, THEN 8] **(choose one) KEEP RESPONSE 3&4 TOGETHER AND IN SEQUENCE.]**

1. From Nova Scotia Power literature
2. From Nova Scotia Power presentation
3. From Nova Scotia Power account manager
4. From another Nova Scotia Power staff person
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 Rebate program
8. Or some other way? (Please specify: _____)
98. (Don't know)
99. (Refused)

P5. What was the single most important reason your company / organization chose to participate in the program? **(DO NOT READ – accept one response – SAME LIST AS P6)**

P6. What was the second most important reason your company / organization chose to participate in the 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 replace non-working equipment)
8. (recommended by utility account rep)
9. (recommended by a contractor)
10. (past participation in another utility program)
11. (Other: Please Specify: _____)
98. (Don't know)
99. (Refused)

Verification of Actions [V series]

V1. [IF SAMPLE VARIABLE LIGHT = YES] Do you recall installing new lighting as part of the Business Energy Rebate program?

1. Yes
2. No (If No: Are you sure? According to our records you received a rebate of \$[LRebate] from Nova Scotia Power for the installation of new lighting)
98. (Don't know)
99. (Refused)

V2. [IF SAMPLE VARIABLE MOTOR = YES] Do you recall installing new motors or variable speed drives as part of the Business Energy Rebate program?

1. Yes
2. No (If No: Are you sure? According to our records you received a rebate of \$[MRebate] from Nova Scotia Power for the installation of new motors or variable speed drives)
98. (Don't know)
99. (Refused)

V3. [IF SAMPLE VARIABLE REF = YES] Do you recall installing refrigeration equipment or upgrades as part of the Business Energy Rebate program?

1. Yes
2. No (If No: Are you sure? According to our records you received a rebate of \$[RRebate] from Nova Scotia Power for the installation of new refrigeration equipment or upgrades speed drives)
98. (Don't know)
99. (Refused)

V4. [IF SAMPLE VARIABLE AIR = YES] Do you recall installing new compressed air equipment or upgrades as part of the Business Energy Rebate program?

1. Yes
2. No (If No: Are you sure? According to our records you received a rebate of \$[ARebate] from Nova Scotia Power for the installation of new compressed air equipment or upgrades)
98. (Don't know)
99. (Refused)

V5. [IF SAMPLE VARIABLE HVAC = YES] Do you recall installing new HVAC equipment or upgrades as part of the Business Energy Rebate program?

1. Yes
2. No (If No: Are you sure? According to our records you received a rebate of \$[HRebate] from Nova Scotia Power for the installation of new HVAC equipment or upgrades)
98. (Don't know)
99. (Refused)

V6. 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 Rebate program? **[RANDOMIZE AND READ]**

1. Outside design professional
2. Contractor
3. Manufacturer representative
4. Utility account manager
5. Someone within your company / organization
98. (Don't know)
99. (Refused)

[ASK V7/V8 FOR EACH MEASURE CATEGORY VERIFIED IN V1 – V5; V1 = Lighting, V2 = motors or variable speed drives, V3 = refrigeration, V4 = compressed air, V5 = HVAC; IF MULTIPLE CATEGORIES – ASK V9 FIRST TIME THROUGH THEN NOT AGAIN ASKING V9 ONCE IS SUFFICIENT]

V7. What single factor was the most important in motivating your company / organization to install energy efficient [MEASURE CATEGORY] equipment or upgrades? **(DO NOT READ – accept one response)**

V8. What factor was the second most important in motivating your company / organization to install energy efficient [MEASURE CATEGORY] equipment or upgrades? **(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 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)

V9. [IF MORE THAN ONE MEASURE CATEGORY] Were the factors motivating you to install energy efficient [OTHER CATEGORIES] equipment or upgrades, any different?

1. Yes – **[REPEAT V7/V8 FOR EACH CATEGORY]**
2. No – **[CONTINUE]**
98. (Don't know) – **[CONTINUE]**
99. (Refused) – **[CONTINUE]**

FREE-RIDERSHIP [FR series]

[ASK EACH QUESTION IN THIS SECTION FOR EACH MEASURE CATEGORY VERIFIED IN V1 –V5]

FR1. Did your company / organization have any specific plans to install any [MEASURE CATEGORY] equipment or upgrades prior to talking with anyone about the Business Energy Rebate program?

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 Business Energy Rebate program. If your company / organization had not participated in the Business Energy Rebate program, which of the following actions do you think you would have taken? Please select all that apply. Would you have... **[For FR2a-d 1 = YES, 2 = NO, 9 = Don't know; For FR2c if YES ask FR2ci]**

FR2a. Postponed installing energy efficient equipment by more than one year

FR2b. Would not have installed any energy efficient equipment

FR2c. Would have installed less energy efficiency equipment

FR2ci. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) less energy efficient equipment?]

FR2d. Would have installed the same amount of energy efficient equipment that was installed through the program

FR3. Nova Scotia Power paid \$[REBATE VALUE FROM SAMPLE BY CATEGORY] for the energy efficient [CATEGORY] equipment or upgrades you installed. If you had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades including the incentive?

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

FR4. How influential were the following elements to your decision to participate in the Business Energy Rebate program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program “had no influence at all on your decision to participate in the program” and 5 indicates that the program was “extremely influential to your decision to participate in the program.” How influential was the:

Element (READ)	(a) Performance of Measure					
a. NSPI Incentives or rebates	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Information, advice, or services provided by a contractor	1 no influence	2	3	4	5 extremely influential	9 DK
d. NSPI Representative	1 no influence	2	3	4	5 extremely influential	9 DK

[IF MULTIPLE MEASURES – RETURN TO TOP OF FR SECTION FOR NEXT MEASURE]

SPILOVER [SP series]

[ASK EACH QUESTION S1 – S4 FOR EACH MEASURE CATEGORY VERIFIED IN V1 –V5]

SP1. Now I'd like you to think about the time since you participated in the Business Energy Rebate program. Has your company purchased and installed any additional [MEASURE CATEGORY] on your own for this or other facilities served by Nova Scotia Power?

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

SP2. [IF SP1 = 1 'YES'] Was this equipment of the same level or a higher level of energy efficiency as the equipment that was rebated by the Business Energy Rebate program?

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

SP3. IF SP1 = 1 'YES'] About how much of the energy efficient [MEASURE CATEGORY] equipment did your company / organization purchase on its own since participating in this program? Please give your response as a percentage of the amount of [measure x] installed or pursued through the program?
 ___ ___ % (Don't know=999) *ALLOW 1-998—THEY COULD HAVE INSTALLED MORE THAN WAS INSTALLED THROUGH THE PROGRAM*

SP4. IF SP1 = 1 'YES'] How influential was your experience with the energy efficient equipment rebated by the Business Energy Rebate program on your decision to install some or all of this energy efficient [MEASURE CATEGORY] equipment on your own? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to purchase additional equipment" and 5 indicates that the program was "extremely influential to your decision to purchase additional equipment."

___ [RECORD RESPONSE 1-5, 98 = Don't know, 99 = REFUSED]

[ASK S5 ONCE AFTER S1 – S4 SERIES HAS BEEN ASKED FOR EACH MEASURE CATEGORY]

SP5. Has your participation in the Business Energy Rebate program influenced other energy efficiency actions that your company / organization have taken?

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

SP6. [IF S5 = YES] What other energy efficient actions has your company / organization taken?

1. (Scoping, feasibility or technical assessments)
2. (Motors or variable speed drives)
3. (HVAC)
4. (Lighting)
5. (Insulation)
6. (Windows)
7. (Energy management system or controls)
8. (Behavioral changes – such as changing thermostat settings)
9. (Air compression)
10. (Refrigeration)
11. (Other: Specify: _____)
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 / organization's experience with each aspect of the Business Energy Rebate program. If your company / organization did not have experience with one of the aspects please tell me. [DO NOT RANDOMIZE] [7 = Not Applicable, 9 = Don't know/Don't recall]

1. Program application, forms and associated paperwork
2. Interaction and communication with staff
3. Availability of Nova Scotia Power 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 / 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 [B series]

B1. Were there any challenges or barriers that you faced in implementing the energy efficient measures rebated by the Business Energy Rebate program?

1. Yes
2. No (**SKIP TO B4**)
98. (Don't know)
99. (Refused)

B2. What was the ONE most important barrier? **(DO NOT READ ACCEPT ONE RESPONSE – SAME LIST AS B3)**

B3. What was the second 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)
15. (Other – SPECIFY: _____)
98. (Don't know)
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 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]**

_____ %

B7. Do you have any suggestions on how to improve the Business Energy Rebate program? Consider all aspects of the program: process, measures covered, marketing, interactions with utility staff, and program forms.

FIRMOGRAPHICS [F series]

F1. What is the principal 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— 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. Other? _____
98. (Don't know)
99. (Refused)

F2. Into which of the following categories does your building floor space fall?

(square meters) (square feet)

1. 93 or less	1,000 or less
2. 93 – 463	1,000-4,999
3. 465-929	5,000-9,999
4. 930-4645	10,000-49,999
5. 4,646-9,290	50,000-99,999
6. Over 9,290	Over 100,000
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. How many hours per week, on average, is this facility open? [998 = Don't know, 999 = Refused]

F5. Is your company independent, or part of a larger company?

- 1. Independent
- 2. Part of a larger company
- 98. (Don't know)
- 99. (Refused)

F6. Besides this facility, how many other facilities does your organization have in Nova Scotia?
[RECORD A NUMBER 1-99; 998 = Don't know, 999 = Refused]

Participant Interview Guide: NSPI C&I BER – Free-ridership and Spillover**Interviewer:****Date of Interview:****Respondent Name:****Title:****Phone Number:**

Hello, my name is _____ from NMR Group, Inc. and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm has performed work for a Nova Scotia Power customer who has participated in the Commercial and Industrial Custom and the Business Energy Rebate programs offered by Nova Scotia Power. As part of our evaluation we would like to ask you a few questions about your interactions with both programs and any additional energy efficiency upgrades your company has made without assistance from Nova Scotia Power. These questions should take about 20 – 30 minutes. Please be aware that the information you provide will be treated as confidential.

With your permission, I would like to record the interview. We will use the recording for transcription purposes in order to make sure we accurately represent your responses. No one but NMR staff members will listen to the recording. NMR will keep all recordings in its files. Do I have your permission to record the interview ____ Yes ____ No

Background and interaction with staff

1. Are you the person at [company] who is most knowledgeable about your experiences with energy efficient equipment or upgrades rebated by Nova Scotia Power?
2. What is your job title? What roles and responsibilities do you have at [company]? Is your area of responsibility limited to areas served by Nova Scotia Power or does it extend outside of Nova Scotia Power's service territory? [If knowledge not limited to Nova Scotia] - Please limit your responses to facilities served by Nova Scotia Power.
3. It is our understanding that [company] operates a variety of businesses in Nova Scotia including: **[consult list]**. Is this correct? Which of these businesses do you have responsibility for? During this interview, we would like you to consider all of the businesses throughout Nova Scotia.
4. In 2010, which of NSPI rebate programs have you worked with? (PROBE: Commercial and Industrial Custom Program (C&I Custom), Business Energy Rebate (BER), Small Business Lighting Solutions Program (SBLS), Small Business Direct Install Program (DI)).
 - a. For each program, when did you participate in the program? For which stores and about how many store locations did you participate in the program?
 - b. How about prior to 2010—which NSPI rebate programs have you participated in prior to 2010?

5. In general, how often do you interact with NSPI energy efficiency program staff? Who do you interact with at NSPI?
 - a. What types of interactions do you typically have with NSPI staff? [Probe: status calls, meetings, etc.] Could these interactions be improved? How so?
6. Some companies work with a design professional, project architect, engineer, equipment contractor or a utility account manager as part of the project design process. I realize that your needs may vary by project but have you used such professionals in the past during project scoping or design?
 - a. [If Yes] – In general, who do you feel is most responsible for specifying the measures to install through the C&I Custom program?
 - b. [If Yes] – In general, who do you feel is most responsible for specifying the measures to install through the BER program?

Program delivery process

The C&I Custom program follows a four-step process: Preliminary Energy Audit/Scoping Study, Feasibility Assessment, Project Implementation and Verification.

7. Which of these steps have you participated in?
 - a. Preliminary audit/scoping study?
 - b. Feasibility assessment?
 - c. Project implementation?
 - d. Verification?
8. In general, are there parts of the program process that you think work well? Are there parts you think do not work well? [Probe: four-steps listed above]
 - a. Are there any processes required by NSPI that you feel are particularly onerous or that pose a barrier to participation in the C&I Custom program? [Probes: Assistance, availability, or interaction with program staff; requirements of any of the four-steps;]

The BER program was designed to streamline the rebate process for C&I Customers implementing five categories of measures: lighting, motors & variable speed drives, refrigeration, compressed air equipment and Heating and Cooling (HVAC) products. In general, measures implemented through the BER program are simpler in nature compared to the C&I Custom program.

9. Which measures have you implemented through the BER program?
 - a. Lighting
 - b. Motors

- c. Refrigeration
 - d. Compressed air
 - e. HVAC
10. Based on your experience with the BER so far, are there parts of the program process that you think work well? Are there parts you think do not work well? [Probe: paperwork, time consuming, etc.]
- a. Are there any processes required by NSPI that you feel are particularly onerous or that pose a barrier to participation in the BER program? [Probes: Assistance, availability, or interaction with program staff;]

Motivations, barriers and gaps

11. What single factor was the most important in motivating your company to install energy efficient equipment or upgrades rebated by NSPI? What other factors were important in motivating your company to install energy efficient equipment or upgrades?
- a. What motivates you to participate in the NSPI rebate programs? [Probe: Save energy, rebates offered, reduce maintenance costs, protect environment, recommended by utility, concerns with carbon, etc.]
12. Were there any challenges or barriers that you faced in making the decision to participate in the NSPI programs? What was the ONE most important barrier? Were there any other barriers?
- a. What barriers exist that might prevent you from participating in NSPI rebate programs for future projects? [PROBE: lack of information, incentive too small, too much work to apply, do not own building, approval takes too long, small C&I excluded etc.]
13. Were there any challenges or barriers that you faced when implementing measures rebated by NSPI? What was the ONE most important barrier? Were there any other barriers?
14. Are there any issues or concerns that you have encountered while participating in NSPI rebate programs? How were these issues or concerns addressed? How could they be addressed in the future?
15. Are there currently any energy efficient measures, upgrades or actions that are not covered by any NSPI programs? That is, are there any gaps in the energy efficiency programs offered by NSPI?

Satisfaction

16. On a scale of 1 to 5, where 1 = 'not at all satisfied' and 5 = 'very satisfied', how was your company's experience with each of the following?
- a. C&I Custom Program Overall
 - b. BER Program Overall

- c. SBLS Program Overall
- d. Interaction and communication with NSPI staff **[Does this vary by program at all?]**
- e. Project implementation
- f. Rebate amounts **[Does this vary by program at all?]**
- g. Measurement and verification
- h. Application, rebate/incentive and associated paperwork **[Does this vary by program at all?]**

Free-ridership [ASK once for C&I and once for BER]

Now I'd like to ask you a few questions about the energy efficiency improvements that you implemented with assistance from NSPI rebate programs.

17. Did your company have any specific plans to install any energy efficient equipment or upgrades prior to talking with anyone about the NSPI rebate programs?

Now I would like to ask you to consider what actions you would have taken in the absence of the NSPI rebate programs. If your company / organization had not participated in these rebate programs, which of the following actions do you think you would have taken? Please select all that apply. Would you have...

18. Postponed installing energy efficient equipment by more than one year
19. Would not have installed any energy efficient equipment
20. Would have installed less energy efficiency equipment
- a. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) less energy efficient equipment?]
21. Would have installed the same amount of energy efficient equipment that was installed through the program
22. If you had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades including the incentive?
23. How influential were the following elements to your decision to participate in the NSPI rebate programs? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to participate in the program" and 5 indicates that the program was "extremely influential to your decision to participate in the program." How influential was the:

Element (READ)						
a. NSPI Incentives or rebates	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Information, advice, or services provided by a contractor	1 no influence	2	3	4	5 extremely influential	9 DK
d. NSPI Representative	1 no influence	2	3	4	5 extremely influential	9 DK

Spillover

Now I'd like you to think about any energy efficient equipment or upgrades that your company is currently pursuing or has installed in the past two years on its own. These measures could include the same type of measures installed through rebate programs or measures not covered by NSPI rebate programs.

24. Is your company currently pursuing or has it purchased and installed any energy efficient equipment or upgrades on your own at any facilities served by Nova Scotia Power.
 - a. What other measures has your company implemented or is currently pursuing?
25. In general, is this equipment of the same level or a higher level of efficiency as the equipment you installed or pursued through the NSPI rebate programs?
26. Where was or will this equipment be installed? (PROBE: Other [locations]?)
27. Did you, or do you plan to implement these energy efficient upgrades through a Nova Scotia Power energy efficiency program? That is, did you or do you expect to receive a rebate from Nova Scotia Power or the New Efficiency Nova Scotia Power Corporation for implementing these energy efficient upgrades?
 - a. Why not?
 - b. When do you plan to implement these energy efficient upgrades? – SKIP TO Q30
28. Approximately, how many kilowatt hours of electricity do you expect you will save IN 2010 as a result of implementing these energy efficient upgrades? Keep in mind that these savings could be from EARLY replacements or changes to existing, less efficient measures and processes; or the

savings could be from PLANNED OR END-OF-LIFE replacements and installations of higher efficiency rather than standard efficiency measures and processes.

- a. And how many kilowatt hours of electricity do you expect to save from using these energy efficient measures or processes over one full calendar year?

29. How influential was your participation in the C&I Custom or BER program to your decision to to implement or pursue these additional energy efficiency actions or measures? Please give your answer on a scale of 1 to 5, where 1 indicates that the programs were “no influence at all” and 5 indicates that the programs were “extremely influential.”

Measure Descrips	Efficiency Level	Implement through NSPI	Why not?	Date Implement	kWh 2010	Annual kWh	Influence

Recommendations for improvements

30. 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? [9=Don’t know/Don’t recall]

—

31. 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? [9=Don’t know/Don’t recall]

—

32. What percent of your annual operating budget do energy costs account for? [999=Don’t know/Don’t recall] ___%

33. Do you have any suggestions on how to improve any of the NSPI rebate programs? Consider all of the programs which you have experience with and all aspects of these programs. [PROBE: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms.]

Staff Interview Guide for NSPI SLC & BER, July 2010**Date:****Name:****Programs responsible for:****Introduction:****[This interview should take about an hour]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:

1. What is the status of the legislation for HPT8s? (Brief question on SLC)
2. When did the program launch? It was originally schedule to launch in mid-May, why did it launch later? Does a later launch mean that you have needed to adjust program targets? Or that it will be more difficult to achieve them?
3. What are the 2010 energy savings goals for [PROGRAM]? Do you think you will achieve these goals? You have a combined target for SLC and BER? Do you know what the split might be?
4. Is there any information you would like us to collect during the 2010 evaluation that would help you to better achieve your goals, improve the way the program operates, or confirm programs assumptions?

We'd like to start by confirming a few things about your role with the program:

5. What percentage of your time do you spend on [PROGRAM]?
6. What, if any, are the responsibilities of other NSPI staff members for [PROGRAM]?
7. Who are groups and individuals that you interact with as part of the [program]... distributors? Retailers?
8. In general, have your interactions with these groups and individuals gone smoothly? Have the various players all been clear as to program goals, the roles and responsibilities of different organizations, needs for coordination? What problems have arisen, if any, and how have they been resolved? Did you encounter any specific barriers to communication or collaboration with others involved in the program, such as turf issues or bureaucratic red tape? Are there any other overall issues with communication, or opportunities for improvement?
9. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program(s) this year?
 - a. Again at the broadest level, what were the areas that were not so successful?

- b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?
- 10. Do you have a plan in place for transitioning the program over to the new administrator? If yes: what does that plan involve? Do you know when you might need to effect this transition?

Theory and Logic Model Review:

- 11. Have you had a chance to review the sample program theory and logic model we provided?
- 12. Does the program have an explicit program theory and logic model?
- 13. In general, how would you characterize the overall goals of the program—would you say that the program is primarily a Resource Acquisition program, where the focus is on delaying or displacing new power plant construction through demand reduction? Or would you say the program is primarily a Market Transformation program, where the focus is on changing practices and building adoption, and ultimately effect changes in NS provincial energy standards? Or is it a combination of the two? Why?
- 14. What are the major components and activities of the program, and what are they intended to accomplish?
 - a. In the short term?
 - b. Intermediate term?
 - c. Long term?
- 15. What are the key outputs from each activity?
- 16. Is there any sequence to these activities, outputs, or outcomes? Are there any of these that need to happen before another takes place? Are there any casual relationships between these activities, outputs, and outcomes?
- 17. How do you expect to measure the extent to which program goals have been accomplished—that is, what are the indicators for the outcomes you expect to achieve? Short-term? Intermediate? Long-term?
 - a. Are there any key indicators or metrics to gauge program effectiveness and success in short-, intermediate-, and long-term?
- 18. What are the assumptions behind the expectations that the program activities will yield the outputs and outcomes, which in turn will help achieve program goals? Assumptions could include:
 - a. Availability of resources and skill sets to organize and manage the program at NSPI
 - b. Availability of resources and skill sets to organize and implement the program at NSPI and / or implementation contractors
 - c. Level of customer motivation and receptivity to program
 - d. Value and effectiveness of program marketing, outreach, and education materials and activities to motivate customers to consider and participate in the program
 - e. Program features that will help overcome barriers to participation
 - f. Value and benefit of the program to any implementation contractors to motivate them to participate in and promote the program
 - g. Characteristics of target customers that make them the appropriate target for the program

- h. Customer energy usage and operational characteristics that will result in the achievement of program goals by the implementation of the program measures
 - i. Effectiveness of the measures in helping achieve program goals
- 19. Who are the key program targets? What do you think are their primary motivations for participating in the program? What are the major barriers to their participation in the program?
- 20. What has changed about the program since the beginning, and why?

Marketing and Verification:

- 21. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
- 22. Overall, how successful has each program been so far? Why / Why not?
- 23. What do you think is particularly good about program delivery of each program? How could program delivery be improved?
- 24. Are there any safeguards to prevent free-ridership in the program? What are they?
- 25. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?
 - a. Are there gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by NSPI programs or any other programs? What could be done to address those gaps?

Strengths and Weaknesses / Wrap-up:

- 26. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
- 27. Based on your experience with the program(s) so far, what are the most important improvements that still need to be made to the program?
- 28. Are there any other program issues we have not discussed that you would like to mention?
- 29. We are planning on conducting interviews with participating distributors are there any other individuals or groups we should speak to about the program?

Thank You



Impact and Process Evaluation: Commercial and Industrial Custom Program 2010

February 25, 2011

Final Report

Submitted to:

Efficiency Nova Scotia Corporation

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Executive Summary

This report presents the results of the process and impact evaluations of the Commercial and Industrial Custom Program (C&I) conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation.

The process evaluation was based on in-depth interviews with DSM Administrator staff and one in-depth interview with a program participant as well as telephone surveys with 13 participants in the 2010 program.

Impact Evaluation Findings

The impact evaluation drew upon a review of program records, telephone survey data and on-site visits at a sample of participating businesses. The telephone surveys were used to estimate free-ridership and spillover. The savings presented in Table 1 are strictly for 2010 activity. In some cases projects were claimed partly according to milestones, set in the project. Based on this evaluation, the NMR team estimates that the generator-level impacts for the 2010 C&I Custom program are 19,413 MWh of energy savings and 2,405.5 kW of demand savings. These savings fall short of the program energy savings goal of 20,000 MWh and the demand savings goal of 3,410 kW. However, the 2010 savings exceed the evaluated savings for 2008 and 2009 combined (16,311 MWh and 2,403 kW), which shows significant growth for the C&I Custom program in 2010.

Table 1: 2010 Program Energy and Demand Savings Summary

	Peak Demand (kW)	Energy (MWh)
Gross savings at generator	2,672.8	21,570
Net-to-Gross Ratio (%)	90%	90%
Net annual savings at generator	2,405.5	19,413

Key Findings¹

Overall Assessment

The C&I Custom program is a well run program with a well-documented and detailed data tracking process, rigorous policies and procedures to screen out free-riders, and a rigorous monitoring and verification (M&V) approach to its tracking savings estimation work. Despite these strengths, in 2010, staff constraints created a bottleneck for NMR's evaluation due to the time required to generate updates and reports as well as the presence of data entry errors. With 2010 savings exceeding the sum total of the previous two years (2008 and 2009), the C&I Custom program was a strong performer in 2010 and came

¹ Note that the numbering for these findings and recommendations corresponds to the numbering in a composite table in the overall Executive Summary of the evaluation of all of NSPI's 2009 Demand Side Management programs.

close to achieving its one-year energy savings goal of 20,000 MWh but fell notably short of reaching its demand target of 3,410 kW. As energy savings were close to targets but demand savings were not, NMR recommends that ENSC may want to consider adapting the program design to permit incentives for demand response, load shifting or other demand-related initiatives.

The mix of programs available to C&I customers was increased in 2010 with the launch of the Business Energy Rebate program. The addition of this program may help streamline program processes and free up resources in the future.

Finally, in 2010, the DSM Administrator started promoting the program more actively through the use of a new position ‘Sales Lead’ that identifies and recruits participants for the program. The resulting higher savings indicated that efforts to increase participation and savings were successful in 2010. Based on the success of the Sales Lead in 2010, the DSM Administrator hired a second Sales Lead in 2011 so as to prepare for even higher program goals in 2011 and 2012. It should be noted that, due to the scale and complexity of projects, C&I Custom projects can have long implementation schedules (up to three years); because some projects may have long lead times, the impacts of successful sales activity in any given year may not be fully realized until some years later. Given the increasing goals of the C&I custom program, outreach and marketing will become correspondingly more important to achieving those goals. The DSM Administrator should continue to work with the Sales Leads as well as encourage contractors to promote the program to their customers.

Program Design and Delivery

Finding	Recommendation
C&I-F1. The C&I Custom program incorporated checks to ensure that participants would not proceed with project implementation unless funding was provided by the DSM Administrator. In 2008, 2009, and 2010 NMR found consistently low, but increasing, levels of free-ridership for the C&I Custom program. At this time NMR is not concerned with the level of free-ridership present in the program but if it continues to increase it may become an area of concern.	C&I-R1. The DSM Administrator should continue to include free-ridership checks as part of the C&I Custom program and should consider including similar checks in any other programs developed for the commercial and industrial sectors. The DSM Administrator should continue to monitor free-ridership as part of the C&I program and if free ridership levels continue to rise, consider adjusting the screening procedures used to identify free-riders.
C&I-F2. Due to the compressed time frame between the end of the program year and the submission of the evaluation report, the C&I Custom program had a compressed timeframe to perform M&V activities related to 2010 projects and to incorporate those results into their tracking system. This was also the case in the 2009 evaluation.	C&I-R2. The NMR team suggests that the C&I Custom program consider moving to a non-calendar year evaluation schedule. The DSM Administrator should consider creating a program year that allows program staff sufficient time to complete their M&V activities and enter the results into the tracking system. After that, a more rigorous impact evaluation effort can be undertaken for the program.
C&I-F3. In 2010, the evaluation process experienced significant bottlenecks due to the time required to generate simple reports detailing completed projects and data entry errors identified in the tracking system for sites in the 2010 sample. Since these errors varied, the tracking system deficiencies were not systemic but the result of errors or inconsistencies in data entry.	C&I-R3. The Program Administrator needs to more rigorously review their tracking database and ensure that all staff members using the database follow consistent data entry protocols.

Program Contractors

Finding	Recommendation
C&I-F4. In contrast to 2008 and 2009, relatively few 2010 respondents reported that they had first heard of the C&I Custom program from a contractor or vendor. However, as in 2009, the majority of 2010 respondents said that someone from outside their organizations was most responsible for specifying the measures installed.	C&I-R4. Conduct training sessions with energy efficiency contractors and design professionals that will educate them on the C&I Custom program. Also work with them to develop marketing tools that they can utilize with customers. Training contractors can be a strong marketing channel for the C&I Custom program, helping to reach those customers who are currently unaware of the program.

Program Marketing and Outreach

Finding	Recommendation
C&I-F5. Program marketing and outreach activities such as the addition of a Sales Lead and print advertising successfully helped increase 2010 program participation and savings. Program staff indicated that contractors could be a particularly effective outreach channel. More than four out of five 2010 respondents (85%) reported that someone outside their organizations was most responsible for specifying the measures that were installed through the C&I Custom program—design professionals (46%) and contractors (23%) were cited most often.	C&I-R5. In 2011, the C&I custom program should build on its 2010 program marketing and outreach activities. Contractors and design professionals represent channels that may be effectively utilized to promote the program.
C&I-F6. As in 2008 and 2009, customers in the 2010 program were motivated to participate in the C&I Custom program primarily because of a financial benefit—77% were motivated by energy savings or costs, eight percent were motivated by savings on maintenance costs, and eight percent were motivated by the incentives.	C&I-R6. Continue to focus on the financial benefits of the program when working with customers and training contractors.
C&I-F7. As in 2008 and 2009, relatively few 2010 survey respondents (31%) reported barriers to participation. The barriers reported were varied and customer specific.	C&I-R7. Continue to work with customers on a case-by-case basis and provide assistance as they work through the program.

Satisfaction

Finding	Recommendation
C&I-F8. In 2008 and 2009, the vast majority of respondents were satisfied with the program overall (91% and 100%, respectively). In addition, the majority of respondents were satisfied with each aspect of the program. In 2010, respondents reported relatively lower levels of satisfaction with the program. Less than one-half of respondents said they were satisfied with their interaction and communications with program staff (47%) and contractors or consultants (33%), or with the list of available consultants (45%).	C&I-R8. The DSM Administrator should review their customer service processes and ensure that they continue to offer a high level of customer service as part of the C&I Custom program.

1 Program Description

1.1 Program Description²

The C&I Custom program was first implemented in May of 2008. The program offers financial incentives to large commercial and industrial customers that complete energy audits or implement energy efficiency measures at their facilities. Most projects follow a four-step process including a preliminary energy audit, a feasibility assessment, implementation and verification. Varying levels of incentives and technical assistance are available at each stage of the process. In 2010, the DSM Administrator offered two distinct programs to help streamline services offered to C&I customers—the C&I Custom program and the C&I New Construction program. Depending upon their specific needs, customers are directed to the appropriate program which then provides them with a clear path for fulfilling those needs.

- The C&I Custom program continues to offer C&I customers incentives to implement complex and large electrical energy saving projects that require detailed study, measurement and verification.
- The C&I New Construction program (CINC) offers incentives to help C&I customers create more energy efficient buildings. The CINC program offers customized support for new construction projects and centers around the Core Performance Guide which defines criteria for high performance in:
 - Building envelopes;
 - Lighting;
 - HVAC;
 - Power systems;
 - Controls;
 - Design guidance;
 - Verification.

This document reports the results of the evaluation of the C&I Custom program. Although the C&I New Construction program launched in the summer of 2010, it did not have any completed projects in 2010 and therefore could not be evaluated. Two new construction projects enrolled in the C&I Custom program prior to the launch of the C&I New Construction program. These projects were included in the C&I Custom evaluation.

² Note that in the in-depth interview, the program manager indicated that the logic model documented in the C&I Custom program manual is essentially correct. NMR accordingly did not develop a program logic model for this report.

2 Impact Evaluation

2.1 Summary of 2010 C&I Custom Savings

This section discusses the savings tracked by the DSM Administrator of 2010 C&I Custom program participants. A summary of this activity is provided in Table 2-1. The savings presented in Table 2-1 include some projects that had partial savings credited due to partial installations that occurred in 2009 or installations that were not completed in 2010, but will be completed in 2011. Partial savings occur where projects have not completed in the year that the project got initiated. Portions of these savings are claimed through milestones and incentives are being paid out accordingly. Partial savings were credited for portions of 2009 projects that completed in 2010 or for installation completed in 2010 while the total project will complete in 2011. Due to several instances of more than one project being implemented at a facility, the number of projects by end use presented below exceeds the number of participating facilities. For sites that were partially completed in 2010, the DSM Administrator estimated the fraction of installations performed and their associated savings. The total installed savings for the 2010 projects was 22,758 MWh of energy savings and 2,805 kW of peak demand savings at the generator.

Table 2-1: Tracking Estimates of 2010 C&I Custom Savings at Generator

End-Use	Number of Projects	Generator Energy Savings (MWh)	Generator Peak Demand Savings (kW)
Lighting Retrofit Only (incl. LED)	49	14,830	1,926
Lighting and Other Technology	31	1,817	122
HVAC Only	2	213	142
Refrigeration Only	3	642	63
Motors/VFDs Only	3	320	16
Power Conditioning Only	4	1,467	127
Other ³	10	3,469	409
Total	102	22,758	2,805

2.2 Sample Methodology

At the time of sampling for this study, the program year was only 80% complete. At that point in time, the C&I Custom program manager provided a best-estimate population of participants and savings based on completed projects and an estimation of projects that would be completed by the end of the year. A total of 93 sites were projected to be completed in 2010 with estimated savings of 29,488 MWh of energy savings and 3,691 kW of demand savings at the generator.

In exploring possible approaches to select the Custom C&I sample, the NMR team used Model-Based Statistical Sampling (MBSS) methodologies. MBSS offers methods for stratifying the populations of interest. Typically, the MBSS methodology begins by sorting the sample population by magnitude of estimated annual kWh savings. As the sample is designed to emphasize the portion of participants with

³ Including: compressed air, EMS, geothermal, low-e ceiling, power conditioning, process improvements, and solar.

larger impacts, MBSS provides an excellent framework for conducting the analysis and the subsequent stratified ratio estimation analyses. Targeting a $\pm 10\%$ relative precision at the 90% confidence interval for energy savings at the program level using MBSS with an error ratio of 0.25 suggested a sample size of 14 would be required. We assumed an error ratio of 0.25 in this work, based upon the fact that the C&I Custom program has a very rigorous monitoring and verification (M&V) approach to its tracking savings estimation work. Every project gets some degree of M&V performed on it, including metering, billing analysis or simulation modeling. However, it should be noted that not all M&V could be done at the time of this study; in particular, many projects that were completed at the end of the year had not undergone final M&V savings work. In these cases, the program tracking system utilized the savings estimated in the Project Development Agreement (PDA).

Table 2-2 provides the final stratified sample design. While we visited 14 sites, one site was removed from the sample as it was discovered that it had been credited to the 2009 program year. The first three columns in the table provide the stratum number, the energy savings cut point used to allocate sites to the strata and the number of projects in each stratum. The final four columns show the savings in each stratum, the sample randomly selected from each stratum, the probability of a site being included in the sample draw, and the case weights in each stratum. Recall that our original sample was designed and drawn from a projected status of sites at year end. Overall, the final sample design remained fairly optimal in capturing greater savings at the larger sites than the smaller ones.

Table 2-2: Final Sample Design

Stratum	Max Savings (MWh)	Projects	Total Savings (MWh)	Sample	Inclusion Probability	Case Weight (N/n)
1	195	75	5,947	3	0.04	25.0
2	381	11	3,254	2	0.18	5.5
3	583	7	3,2780	3	0.43	2.3
4	1,069	5	4,076	2	0.40	2.5
5	2,242	4	6,202	3	0.75	1.3

As Table 2-3 shows, there was reasonable diversity of measure types represented in the selected sample. As in the population, lighting measures represented the majority of the sample. Lighting savings were also the most substantial among the largest sites in the population, which had a higher likelihood of inclusion in our sample than sites with lower energy savings. Non-lighting measures reviewed and analyzed included refrigeration, motors, HVAC, and envelope installations. The final sample had six sites for which M&V was completed and incorporated into the tracking savings and seven sites for which the PDA savings were used as the tracking estimate of savings.

Table 2-3: Summary of Final Sample

Measure Type	Number of Projects
Lighting Retrofit (incl. LED)	11
Refrigeration	1
Motors	1
HVAC	1
Envelope	1

2.3 Savings Methodology

The impact evaluation for the C&I Custom program covered a variety of measure types. This section contains an overview of the approach taken for each measure type in the sample. Individual site write-ups are included in Appendix A.

2.3.1 Lighting

Generally speaking, the scope of lighting measures in the 2010 sample was extensive. Accordingly, it was necessary to prioritize on-site data collection according to the factors with the greatest impact on the gross saving estimates. In order of precedence, these factors included:

- Verifying that the proposed lighting had been installed as planned.*

In general, a census or near census of all installed lights was conducted. In rare cases where the number of fixtures was too large to count, samples of the retrofit fixtures were inspected. In these cases, sampled fixtures were chosen on the basis of their savings relative to gross project savings. Accordingly, lighting groups responsible for significant savings were prioritized over small savers. Also, if significant fixture count or type discrepancies had been identified in the course of verification, additional areas with similar fixtures types would have been sampled. Because the fixture types and counts verified on-site matched the DSM Administrator's fixture counts within reason, additional sampling was not needed.
- Confirming that the operating schedules used in the DSM Administrator's M&V analysis coincided with current operations.*

To confirm operating schedules, site contacts were generally asked to provide lighting schedules for all areas of the facility affected by the lighting retrofit. If lighting schedules had been adjusted in the M&V process through the use of metered data results, the site contacts were asked to verify that the metered operating schedules agreed with current facility conditions.
- Identifying lighting areas metered post-measure implementation to determine the applicability of collected trend data.*

Where metering was performed and completed, site contacts were asked to identify the building areas where meters or loggers had been installed. By confirming logger installation areas, site contacts provided a means of verifying that metered data had been applied to the correct areas in the DSM Administrator's M&V analysis.

- *Identifying the areas of the facility served by cooling and electric heating systems to assist in calculating interactive effects savings.*

At all sites with either electric space cooling or electric space heating, interactive effects savings were assessed in the DSM Administrator's M&V analysis. Therefore, site contacts were asked to identify areas at each facility served by space cooling and electric heating systems. These data were subsequently used to update the M&V interactive savings analysis as necessary.

- *Verifying that the pre-existing fixture types listed in the DSM Administrator's analysis spreadsheet generally agree with the fixture types remembered by the site contact.*

None of the facilities in the sample had examples of the pre-retrofit fixtures available for inspection. Site contacts were therefore asked whether or not the baseline fixture types listed in the M&V analysis were reasonable given what they remembered about the spaces in their pre-retrofit condition. In cases where the pre- and post-retrofit fixture counts differed substantially, site contacts were also asked to verify that the pre-retrofit fixture counts seemed appropriate. Issues with the pre-retrofit equipment specification were not identified at any of the sites.

2.3.2 Traffic Lighting

The 2010 sample included a single traffic lighting project. For this project, on-site work included verifying that the proposed fixtures had been installed in the correct quantities at a sample of intersections. Inspected intersections were chosen by cross referencing the project's intersection list with a map of the municipality. Intersection selection was designed to select geographically dispersed locations. In addition to verifying sampled intersections, the municipal traffic office was visited to inspect samples of the newly installed fixtures and collect fixture wattage data. For more information on data collection activities see Appendix A.

2.3.3 Motors

The 2010 sample included a single motor project. The primary on-site work at this facility consisted of verifying that each of the 43 affected motors had been installed as proposed. Nameplate data, including make, model, horsepower, nominal efficiency, and rated power factor were collected. In addition to verifying that the motors were installed as proposed, operating schedule data were collected from the site contact. The site contact was also asked to provide metered data collected as part of the project M&V since the data provided by the Program Administrator did not include the M&V data. For more information on the on-site activities performed at this facility, as well as a synopsis of the motor data collected while on site, refer to Appendix A.

2.3.4 Comprehensive "Whole Building" Site

The 2010 sample included a newly constructed facility that can best be characterized as a "whole building" energy efficiency project. This project included HVAC, insulation and lighting measures. Since both the lighting and insulation measures had a direct impact on the HVAC savings, it was necessary to investigate savings for each measure simultaneously. As such, a building simulation modeling approach was taken for the evaluation analysis. On-site data collection was therefore tailored to gathered data useful in facility modeling. The site contact was asked about occupancy schedules, lighting schedules, and HVAC set points and schedules in each distinct building area. In addition, the site contact was asked to provide a set of facility plans which were subsequently used in modeling building shell, HVAC, and

lighting systems. Lastly, a facility walkthrough was conducted to verify that the proposed HVAC and lighting measures were installed and operating as proposed. Nameplate data were also collected from the HVAC equipment to assist in informing the facility model.

2.3.5 Refrigeration

The 2010 sample included a refrigeration project where control and operational modifications were made at 19 different locations. The refrigeration measures focused on beverage coolers in the stores. Evaporator fan controls and cooler door anti-condensate heater controls were installed in all 19 locations. The evaporator fan controls enabled the fans only when needed according to box temperatures. The anti-condensate heater controls energized the heating circuits according to humidity levels. Fans and heaters operated continuously in the baseline. Ten of the refrigeration-sites included an outside air cooling option. Ductwork and pony fans were installed in the coolers to draw outside air into the box when exterior air temperatures dropped below cooler box temperature set points.

Site visits were conducted at four locations to verify the equipment and installations. All four sites had evaporator fan and anti-condensate heater controls. Two locations also had the outside air cooling option. The cooler box specifications [dimensions and operating temperature] were verified in the field. The number of cooler doors, evaporator fans, and condensing units were recorded. Nameplate power data [volts, amps, and phase] were noted for the fans, compressors, and door heaters. Temperatures and operating hours were discussed with store managers. This site data was compared to the corresponding values in the tracking documentation and calculation spreadsheets.

Once all measure level savings were calculated for each sampled site, the NMR Team developed an estimate of annual energy savings and peak demand savings at the generator level. These site level results were then used to develop the program level impacts through the use of stratified ratio estimation techniques. For more information on this process and the statistical process surrounding this expansion of results see Appendix A.

2.4 Results

Figure 2-1 presents a scatter plot of the on-site sample gross savings estimates of annual savings at the generator, including interactive effects. There is a strong correlation between the tracking system and gross savings estimates, as shown in the graph. There are three primary reasons for the strong correlation:

- The short duration between the installation and our on-site visits did not permit much change from business transitions or remodeling;
- In instances where we used self-reported hours of operation in lieu of M&V data, these reported hours did not introduce significant variation between the tracking estimate of savings and the NMR Team's gross estimate of savings;
- In instances where M&V data was available and was used in the program estimate, it was generally used in a manner that did not require refinement.

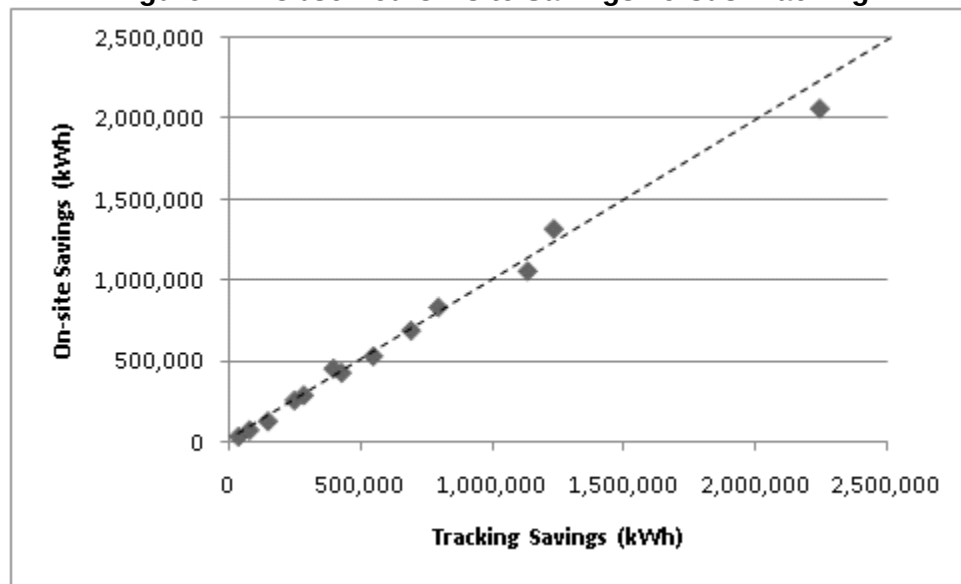
Figure 2-1: Observed On-site Savings versus Tracking

Table 2-4 presents the installed annual energy and demand savings for the 2010 C&I Custom program. This table includes the original population tracking savings and the expanded savings estimates from the on-site observations. As described earlier, these on-site estimates have been calculated to include interactive effects at the generator level. The 2010 installed annual energy savings for the C&I Custom program is determined to be 21,570 MWh at the generator level with a realization rate of 94.8%. The peak demand savings are calculated to be 2,672.8 kW at the generator level.

Table 2-4: 2010 Installed C&I Custom Annual Energy and Demand Savings

Savings Estimate	Annual Energy Savings (MWh)	Realization Rate	Peak Demand Savings (kW)	Realization Rate
Tracking Annual Savings	22,758	N/A	2,805.8	N/A
Evaluated Annual Savings at Generator	21,570	94.8%	2,672.8	95.3%

Table 2-5 shows the realization rates from the 2008, 2009, and 2010 evaluations. As illustrated in the table, the evaluation methods for each year have relied on on-site visits with the use of either the M&V data or the PDA information as a basis for re-engineering the savings estimate when appropriate. Historically, the evaluated savings for the C&I Custom program have been very stable, with realization rates between 95% and 110% each year. Although many factors influence the realization rates, in 2010 the most significant change in savings in the sample was at a motor site, where some revisions to the inputs and the savings approach caused the savings to go down approximately 14%. This, among other factors, contributed to the relatively lower realization rate in 2010.

Table 2-5: Comparison of 2008, 2009 and 2010 Evaluation Results

Year	Overview of Study Activity	Realization Rate
2008	Eight lighting sites and one non-lighting site (compressed air)	107%
2009	Five lighting sites, one low-e ceiling site, two refrigeration-sites, two HVAC sites, one combined savings site (HVAC, lighting, and building shell)	110%
2010	Eleven lighting sites, one refrigeration-site, one motor site, one HVAC, and one envelope	95%

2.5 Spillover

Participants were asked about participant-like⁴ spillover, which is a situation in which a customer installed additional equipment of the same type as was installed through the program due to program influences. None of the participants reported any additional purchases or installations of the same types of measures as they had installed through the C&I Custom program. Based on this, the participant-like spillover rate for the C&I Custom program is zero. This is not unexpected given the custom and inclusive nature of the C&I Custom program. Participants were likely to use the program for any additional purchases or installations. It should be noted that in 2008 and 2009 some surveyed participants reported non-like spillover and DSM Administrator staff mentioned cases of participants pursuing additional energy efficiency measures outside of the program.

In order to help determine the extent of non-like spillover, NMR added a series of questions to gauge the impact of non-like spillover and conducted an in-depth interview with one large C&I Custom program participant. Three respondents reported implementing or pursuing additional measures; however, when asked if they planned to implement or had implemented the measures using a DSM Administrator rebate program all three said they intended to do so. In addition, in the in-depth interview, the C&I Custom program participant stated that since the DSM Administrator began offering incentives for C&I energy efficiency projects, they have made every attempt to take advantage of rebates and incentives for all projects they have implemented.

2.6 Free-ridership

In order to determine the extent of free-ridership, participants were asked a series of questions related to their plans to pursue program measures before participating in the program, as well as the influence and

⁴ Participant-like spillover is a conservative approach used to estimate spillover by asking participants about measures installed outside the program that are exactly the same type and efficiency as the ones installed through the program.

importance of the program on their decisions to install program measures. The free-ridership questions are divided into three general categories: program influence, stated intent, and screening/cross-check questions (Table 2-6, Table 2-7, and Table 2-8).

Table 2-6: Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
Now I would like to ask you to consider what actions you would have taken in the absence of the C&I Custom program. If your company / organization had not participated in the C&I Custom program, which of the following actions do you think you would have taken? Please select all that apply. Would you have...			
FR2a.	Postponed installing energy efficient equipment by more than one year	Yes No	0% 50%
FR2b.	Would not have installed any energy efficient equipment	Don't know	25%
FR2c.	Would have installed less energy efficient equipment	Yes No Don't know	See (i) 50% 25%
FR2ei.	[IF FR2e = YES] Would you have installed slightly, somewhat or significantly less energy efficient equipment?	Slightly Somewhat Significantly Don't know	25% 25% 0% 25%
FR2d.	Would have installed the same amount of energy efficient equipment that was installed through the program	Yes No Don't know	50% 25% 25%
Stated Intent Score = average of FR2a, FR2b, FR2c+ci, and FR2d.			

Table 2-7: Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following elements to your decision to participate in the C&I Custom program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to install the energy efficient equipment" and 5 indicates that the program was "extremely influential to your decision to install the energy efficient equipment." How influential was / were the:			
FR4a.	NSPI Incentive	1	50%
FR4b.	Installation contractor	2	37.5%
FR4c.	NSPI representative	3	25%
FR4d.	NSPI funded preliminary energy audit or scoping study	4	12.5%
FR4e.	NSPI funded feasibility study	5	0%
		Don't know	25%
Program Influence Score = maximum of FR4a, FR4b, FR4c, FR4d and FR4e.			

Table 2-8: Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Score
Screening			
FR1.	Did your organization have any specific plans to pursue [measure] prior to talking with anyone about the C&I Custom program?	Yes No plans Don't know	N/A
Budget Check			
FR3.	If your company had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the project including the incentive?	Yes No Don't know	N/A

Based on their responses to these questions NMR divided respondents into three distinct groups:

- Full free-riders – those participants who would have installed the same energy efficiency measures in the absence of the program;
- Non-free-riders – those participants who would not have installed any of the energy efficient measures within one year of program participation;
- Partial free-riders – those participants who would have installed measures within one year of program participation, but in smaller quantities or of lesser efficiency.

2.6.1 Full Free-riders

Respondents were identified as full free-riders if they simultaneously met three criteria:

- They stated that their organization had pre-existing specific plans to install energy efficient equipment prior to talking with anyone about the C&I Custom program:
FR1 = YES (see Table 2-8)

AND

- They said that their budget could have accommodated the full cost of installing the energy efficient equipment: FR3 = 0 (see Table 2-8)

AND

- They said that, in the absence of the C&I Custom program, they would have installed the same amount of energy efficient equipment that was installed through the program within one year:
FR2a = 1 and FR2d = 1 (see Table 2-6)

Among the 13 respondents, none were classified as a full (100%) free-rider.

2.6.2 Non-Free-riders

Respondents were identified as non-free-riders if they simultaneously met the following four criteria:

- They stated that their organization had no pre-existing plans to install energy efficient equipment prior to talking with anyone about the C&I Custom program:

FR1 = NO (see Table 2-8)

AND

- They said at least one program element was ‘extremely’ influential to their decision to install energy efficient equipment:

Maximum value of FR4a, FR4b, FR4c, FR4d, FR4e = 5 (see Table 2-7)

AND

- They indicated they their budget would not have accommodated installing energy efficient equipment in the absence of the program:

Free-rider rate for FR2a, FR2b, and FR2ci = 0% (see Table 2-6)

AND

- They indicated they would have installed significantly less energy efficient equipment in the absence of the program:

Free-rider rate for FR2ci = Significantly less (see Table 2-6)

Among the 13 respondents, four respondents were classified as non-free-riders (0%). According to program records, these four respondents account for 49% of the total energy and 45% of the total demand savings for the sample of 13 respondents.

2.6.3 Partial Free-riders

Respondents not identified as either a full free-rider or a non-free-rider were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relies on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence, the results are then averaged to determine a final free-ridership rate.

2.6.3.1 Stated Intentions

In order to derive respondents’ intentions, they were asked to consider what actions they would have taken in the absence of the C&I Custom program. Respondents were asked four questions as shown in Table 2-6. Based on their responses each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 31.25%.

- FR2a = Yes (0%)
- FR2b = No (50%)
- FR2c = Yes; FR2ci = Somewhat (25%)
- FR2d = Yes (50%)

2.6.3.2 Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of five program elements on their decision to install energy efficient lighting on a scale of one to five, where one meant the program ‘had no influence at all’ on their decision and five meant that the program was ‘extremely influential’ to their decision to install energy efficient lighting.

2.6.3.3 Impact of Budget

For respondents who received a stated intentions free-ridership rate of 50% a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project, no adjustments were made; if they said their budget could not have accommodated the project, their free-rider stated intent score was reduced to 25%.

2.6.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each participant, their free-rider stated intent score was averaged with their program influence free-rider score.

In 2008 and 2009, to calculate the final free-ridership rate for the C&I program, each participant was assigned a weight based on estimated energy and demand savings from program records. In 2010, based on the sample of respondents, it was not possible to weight respondents because two respondents accounted for over 60% of the total savings in the sample, which would have skewed the results. As such, the final free ridership estimates are based on the unweighted average of free ridership among the 13 respondents. The measures implemented by the 13 respondents to the 2010 survey account for 25% of total 2010 program tracked energy savings and 22% of 2010 tracked demand savings. In addition, the measures implemented by respondents to the 2010 survey offer a reasonable match to the measures implemented by the population as a whole.⁵ As Table 2-9 shows, the free-ridership levels for the C&I Custom program rose steadily between 2008 and 2010. It is important to note that NMR used three separate methods to calculate free-ridership between 2008 and 2010 for the C&I Custom program.

- In 2008, NMR used a multiplicative approach and a series of questions based on the standardized methods outlined by PA Consulting in 2003.⁶
- In 2009, NMR used a similar approach as in 2008. However, for the 2009 free-ridership calculations, the NMR team adopted the use of an arithmetic mean for two components of the

⁵ See Section 3.6

⁶ PA (2003) *Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report*. Submitted June 16, 2003

free-ridership as well as a more conservative scoring method for all of the factors in the free-ridership calculations.

- In 2010, based on the decision of the DSM Administrator-coordinated Free-ridership Symposium (May 2010), NMR completely revised the free-ridership questions included in the 2010 survey and mirrored the free-ridership calculations developed for the Energy Trust of Oregon by Research into Action.

Table 2-9: Free-ridership

	2008		2009		2010	
	Demand	Energy	Demand	Energy	Demand	Energy
<i>Sample size</i>	11	11	9	9	13	13
Free-ridership rate	2%	1%	7%	6%	10%	10%

2.7 Net-to-Gross Ratio

For the C&I Custom program, the net-to-gross ratio is calculated based on spillover and free-ridership. For the 2010 program year, the net-to-gross ratio for the C&I Custom program is 90% for energy savings and 90% for demand savings.

2.8 Energy Savings Estimation

Table 2-10 presents the net installed annual energy and demand savings for the 2010 C&I Custom program. The net annual savings were based on the original population tracking savings, the expanded savings estimates from the on-site observations and the net-to-gross ratio derived from the participant survey. These estimates did not include the impact of projects that had been committed but not completed in 2010.

For the 2010 program year, the generator-level impacts were estimated at 19,413 MWh of energy savings and 2,405.5 kW of demand savings. These savings fall short of the program energy savings goal of 20,000 MWh and the demand savings goal of 3,410 kW.⁷ However, the 2010 savings exceed the evaluated savings for 2008 and 2009 combined (16,311 MWh and 2,403 kW), which shows significant growth for the C&I Custom program in 2010.

Table 2-10: 2010 Final C&I Custom Energy and Demand Savings Summary

	Tracking Estimate		Evaluated Impact Savings Estimate	
	Energy (MWh)	Peak Demand (kW)	Energy (MWh)	Peak Demand (kW)
Installed annual savings at generator				
Gross savings	22,758	2,805	21,570	2,672.8
Net-to-gross ratio			90%	90%
Net savings			19,413	2,405.5

⁷ Note that these include the savings goals for the C&I Custom and New Construction programs combined.

3 Process Evaluation

3.1 Methodology

The process evaluation of the 2010 C&I Custom program relied upon in-depth interviews conducted with program staff and one program participant as well as surveys of 2010 program participants.

3.1.1 In-Depth Interviews

NMR executives conducted an in-depth interview in July of 2010 with the C&I Custom program manager. The interview covered a variety of program-related topics including program goals, program theory and delivery.

The NMR team also conducted an in-depth interview in January of 2011 with one program participant. The interview covered a variety of areas including program awareness, communication and interaction with C&I Custom staff, motivations and barriers, satisfaction with the program, and spillover and free-ridership.

3.1.2 Telephone Surveys

NMR completed a total of 13 interviews with 2010 program participants. The sample of participants was provided by the DSM Administrator from its tracking database which, as of December 2010, included 47 unique 2010 participants.

The surveys were conducted by NMR's subcontractor, Interviewing Service of America, out of its offices in Halifax, NS. The interviews were conducted between August 2010 and January 2011 utilizing computer-assisted telephone interviewing (CATI) and contact information provided by the DSM Administrator.

3.1.3 Sampling Error

Table 3-1 shows the total population, telephone survey sample size and the associated sampling error (adjusted for the finite population size) at the 90% confidence level.

Table 3-1: Sample Size and Sampling Error

	Population	Sample Size (n)	Sampling Error at 90% Confidence Interval
Participant	47	13	±19.61%

3.2 Program Goals and Design

The C&I Custom program was developed in-house by DSM Administrator staff; some features were modeled after the Manitoba Hydro Performance Optimization Program. The program offers incentives for commercial and industrial customers to conduct energy audits and feasibility studies and to implement energy efficiency improvements. Most projects follow a four-stage process, including a preliminary audit, a feasibility assessment, project implementation and verification of savings. As of 2010, projects that were more prescriptive in nature and were determined not to need additional scoping or feasibility studies were funneled into the Business Energy Rebate (BER) program. Up until the launch of the C&I New Construction (CINC) program new construction projects were included in the C&I Custom program. By offering more streamlined options for specific project types, it is believed that the C&I Custom program will be better able to serve those projects that are truly custom and require additional study.

Preliminary Audit

The preliminary audit was a cursory investigation that was used to identify opportunities to save electrical energy usage. Customers who had already identified energy saving opportunities may not have required a preliminary audit.

Feasibility Study

The feasibility study was a detailed energy audit that assessed measures identified in a preliminary audit. The study developed estimated costs and energy savings for each of the measures.

Implementation

Using the costs and energy savings identified in the feasibility study, the project was analyzed and an implementation incentive range was calculated by the DSM Administrator. The actual implementation incentive was negotiated with the customer for each project but had to fall inside the range calculated by the DSM Administrator. Once the implementation incentive had been determined, customers moved forward with implementation of the energy efficiency measures.

Measurement & Verification (M&V)

After completing implementation, the customer was responsible for providing information to verify the costs incurred as well as the savings resulting from implementation. The DSM Administrator worked with customers to develop a suitable M&V method.

The 2010 program was designed to meet goals of 20,000 MWh of energy savings and 3,410 kW of demand savings. To achieve these goals, the program offered incentives of up to \$500,000 for a single project including on-bill financing. The program also offered an incentive of up to 50% of customer costs up to \$1,000 for energy audits, an incentive of up to \$15,000 for feasibility studies, and an implementation incentive based on the following criteria:⁸

- The sum of all incentives – energy audit incentive, feasibility incentive, and implementation incentive – could not exceed \$500,000;
- After incentives, a participant's simple payback could not be reduced to less than 1 year;
- Incentives could not exceed 50% of customer's eligible costs;

⁸ Incentive caps can be exceeded at the discretion of the DSM Administrator.

- Incentives could not exceed \$0.15 per kWh of first-year projected energy savings;
- Incentives could not exceed a prorated share of the total C&I incentive budget, based on expected annual energy savings.

The incentive for each project was calculated based on factors including estimated energy and system peak demand savings, avoided cost benefits, project costs, total costs to the DSM Administrator, annual budget and savings goals for the C&I Custom program, and customer simple payback. Calculations were done in an MS Excel workbook maintained by the DSM Administrator as well as additional software for internal M&V.

3.2.1 Assessment of Free-ridership Likelihood

Since the funding for the C&I Custom program was intended for projects that would not proceed without an incentive or financing, the program incorporated checks to ensure that participants would not proceed with program implementation without program assistance. The program staff spoke with each customer to ensure that the project would not proceed without funding and the DSM Administrator required that the feasibility study report provide rationale for the project funding such as:

- Project did not meet the customer's investment criteria (hurdle rate, simple payback, other)
- Customer was unable to raise the needed capital
- Project was a lost opportunity. For example, a customer had to upgrade equipment but could not buy a more energy-efficient option.

3.2.2 Data Tracking

In 2010, the C&I Custom program seemed to have reached a point where staff constraints created a bottleneck for evaluation. In the 2008 evaluation, NMR found that while *'the C&I program had a well thought out and documented data-tracking process; the method by which the data were tracked was overly burdensome and would scale poorly if the program experienced increased participation levels.'* In 2010, the data-tracking process appeared to have reached the point where it no longer scaled well with the program. In 2010, the evaluation process experienced significant bottlenecks due to the time required to generate simple reports detailing completed projects and data entry errors identified in the tracking system for sites in the 2010 sample. Specifically, the evaluation identified data entry errors due to human error in the tracking system for three sites in the evaluated sample. The errors varied across each of the sites. At one site, the Project Development Agreement (PDA) savings were entered for both energy and demand even though M&V savings analysis had been completed. A second site had a similar issue, although at this site only demand savings were taken from the PDA. At a third site, the demand savings was specified at the meter instead of being specified at the generator level as was done for all other sites in the sample. Furthermore, the input demand savings at this site were not scaled by a peak coincidence factor as was done for all other sites in the sample. Since these errors varied, the tracking system deficiencies were clearly not systemic but the result of errors or inconsistencies in data entry.

A centralized data system was implemented in the summer of 2010. While all 2010 projects are integrated into the new centralized data system, additional work remains to be done to fine-tune the system. NMR understands that implementing a centralized data tracking system takes time and that DSM Administrator staff will fine-tune the system over time. The 2010 evaluation shows the clear need for improved data tracking, especially in regard to data entry. The DSM Administrator can avoid similar errors by more

rigorously reviewing their tracking data and ensuring that all staff members using the database follow the data entry protocols.

3.3 Outreach and Marketing

In 2008 and 2009, the C&I Custom program relied on public speaking engagements, e-mails, the NSPI website, and outreach conducted by contractors to attract projects. In addition to these activities, in 2010, the DSM Administrator added a new position, ‘Sales Lead,’ to identify and recruit participants into the program. The Sales Lead advises customers on actions as well as helps identify which program would be best suited to serve their needs. They also advertised the program in print media, specifically local magazines and business journals. Additionally, program staff indicated that contractors could be a particularly effective outreach channel.

3.4 Program Awareness

As Table 3-2 shows, about three out of ten (31%) 2010 respondents said they had first heard about the program from NSPI—an NSPI presentation (15%), an NSPI staff person (8%), or through NSPI literature (8%). One out four of the 2010 respondents (23%) reported having first heard about the program through a contractor, a vendor or word of mouth. Nearly one in four (23%) respondents said they had first heard about the program through a recreation facility association.⁹

Table 3-2: Source of First Awareness of C&I Custom Program

	2008 Participants	2009 Participants	2010 Participants
<i>Sample size</i>	11	13	13
Recreation Facility Association	0%	0%	23%
Word of mouth	18	15	15
NSPI presentation	9	23	15
Contractor/Vendor	36	46	8
NSPI staff	18	--	8
NSPI literature	9	--	8
Internet/NSPI website	--	8	8
Trade show	--	--	8
Researched something similar in Manitoba	9	--	--
Don't know	--	8	8

⁹ The recreation facility association was a curling rink association that had directed members to the program.

One of the 2010 participants said they had participated in another energy efficiency program in 2009 but had been unable to provide a description of the program. (Table 3-3)

Table 3-3: Prior Program Participation

	2008 Participants	2009 Participants	2010 Participants
<i>Sample size</i>	11	13	13
No	91%	100%	92%
Yes	9	0	8
Prior Program Descriptions			
Description	Electric water heating program (1)	na	Don't know (1)

3.5 Participation Motivations and Barriers

When asked their primary reason for participating in the C&I Custom program, the majority of 2010 respondents reported a financial benefit (93%) as their primary motivation—77% reported saving on energy/energy costs, eight percent reported the program incentives, and eight percent reported reducing maintenance costs. When asked about secondary motivations, financial incentives were, again, the most cited motivation (23% mentioned program incentives and 8% mentioned saving on energy costs). Other secondary motivations reported by 2010 respondents included reducing their carbon footprint (15%), replacing non-operational equipment (8%), and protecting the environment (8%).

Similarly, the majority of the respondents reported a financial benefit as their primary motivation for pursuing the feasibility study (84%). More than eight out of ten respondents cited saving on energy costs (85%) as the main reason for implementing the measures and the incentives (8%) was the most cited secondary reason for implementing the measures. (Table 3-4)

Table 3-4: Participant Motivations

Reasons for Participating in C&I Custom program	2008 Participants (n=11)		2009 Participants (n=13)		2010 Participants (n=13)	
	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
Save on energy/energy costs	45%	18%	46%	46%	77%	8%
Incentives	55	36	31	15	8	23
Protect environment	--	--	15	8	8	8
Reduce maintenance costs	--	9	--	--	8	--
Reduce carbon footprint	--	--	--	--	--	15
Replace non-operational equipment	--	--	--	--	--	8
Ease of program participation	--	18	--	8	--	--
Improve existing lighting conditions	--	9	--	8	--	--
Don't know	--	9	8	15	--	15
Reasons for Pursuing Feasibility Study	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
Save on energy/energy costs	45%	36%	50%	36%	69%	--
Incentives	36	--	8	9	15	8
Part of existing retrofit efforts	9	--	--	--	8	--
Help protect the environment	--	9	25	9	8	17
Reduce maintenance costs	--	--	--	--	--	17
Reduce carbon footprint	--	--	--	--	--	17
See what was available	--	--	--	--	--	8
Verify the program	9	--	--	--	--	--
Improve existing lighting conditions	--	9	8	18	--	--
Wanted expert advice	--	9	--	--	--	--
Operational needs	--	9	--	--	--	--
Other	--	--	--	9	--	--
Don't know	--	27	9	18	--	33
Reasons for Implementing Measures	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
Save on energy/energy costs	64%	36%	64%	9%	85%	0%
Incentives	9	--	--	--	8	8
Reduce maintenance costs	--	9	9	--	--	23
Reduce carbon footprint	--	--	9	--	--	15
Improve existing lighting conditions	9	9	--	36	--	8
Help protect the environment	--	9	--	9	--	8
Payback	9	--	--	--	--	--
In line with core business	--	27	--	--	--	--
Part of sustainability policy	--	9	--	--	--	--
Recommended by engineer	--	--	9	--	--	--
Resource conservation	--	--	9	--	--	--
Energy efficiency	--	--	--	18	--	--
Other	9	--	--	9	--	--
Don't know	--	--	--	9	8	39

As in 2008 and 2009, over one-half of 2010 respondents (69%) reported that they had faced no barriers to participation in the program. Three out of 13 respondents reported have faced a barrier: one thought they had faced barriers to participation because they were a non-profit company,¹⁰ one said they had difficulties communicating with a contractor, and one said their remote location had created a barrier.

Table 3-5: Participant Barriers

Barriers Faced During Program	2008 Participants (n=11)		2009 Participants (n=13)		2010 Participants (n=13)	
	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
No barriers	55%	55%	53%	53%	69%	69%
Barriers to non-profit participation	--	--	--	--	8	--
Contractor communications	--	--	--	--	8	--
Remote location	--	--	--	--	8	--
Communicating savings	9	--	--	--	--	--
Believing they were there to help us	9	--	--	--	--	--
Integrating	9	--	--	--	--	--
Time of day (work done at night)*	9	--	--	--	--	--
Voltage change*	9	--	--	--	--	--
Explaining the operation and principles behind the project	--	9	--	--	--	--
Lack of personnel	--	--	15	--	--	--
Payback timeframe	--	--	8	--	--	--
Contract language	--	--	8	--	--	--
Consultant error	--	--	8	--	--	--
Complicated communication	--	--	8	--	--	--
Legal issues	--	--	--	8	--	--
Don't know	--	36	--	23	--	31

* These are not program-related barriers.

3.6 Implemented Measures

The proportion of measures implemented by the 2010 survey respondents closely match the proportion of measures implemented by the 2010 population as a whole. In addition, the measures implemented by respondents to the 2010 survey accounted for about one-quarter of total 2010 program tracked energy and demand savings. About two out of five participants in the 2010 population (44%) and the survey (45%) retrofitted their lighting through the C&I Custom program. Other survey participants also implemented HVAC, control, and process measures. None of the participants who had implemented refrigeration, controls, power conditioning, process improvements, solar or building envelope measures responded to the 2010 survey. (Table 3-6)

¹⁰ Note that the program makes no distinction between non-profit and for profit companies.

Table 3-6: Measures Implemented – Participants

Measure Implemented	2008		2009		2010	
	Respondents	Population	Respondents	Population	Respondents	Population
Sample size	11	15	13	34	13	47
Lighting retrofit	82%	80%	69%	66%	45%	44%
HVAC	--	--	12	4	27	26
Low-e ceilings	--	--	--	11	24	15
Refrigeration	0	6	--	13	--	5
Controls	--	--	12	4	--	3
Power conditioning	--	--	--	--	--	3
Process	--	--	6	2	--	1
Solar	--	--	--	--	--	1
Building envelope	--	--	--	--	--	1
Ammonia compressor retrofit	9	6	--	--	--	--
Pump replacement	9	6	--	--	--	--
Heat treatment oven	0	6	--	--	--	--

While respondents did not report any additional installations of the same equipment type as they had installed through the C&I Custom program, nearly one out of four respondents (23%) reported pursuing additional energy efficiency measures or feasibility studies. Measures implemented or pursued by participants after participating in the C&I Custom program include refrigeration, windows, insulation, and HVAC. (Table 3-7) 2010 respondents were also asked if they planned to implement these additional measures through a DSM Administrator energy efficiency program or if they expected to receive any rebates or incentives from the DSM Administrator for the improvements. All three respondents who said they were pursuing additional energy efficient measures said they planned to implement them through a DSM Administrator energy efficiency program or expected to receive an incentive or rebate from the DSM Administrator.

Table 3-7: Additional Purchases of Energy Efficiency Equipment

	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
Additional energy efficiency measures	27%	23%	15%
Additional feasibility studies	18	39	8
Have not pursued any additional energy efficiency	55	38	77
Types of Energy Efficiency Equipment	2008 Respondents	2009 Respondents	2010 Respondents*
<i>Sample size</i>	5	8	3
Refrigeration	0%	0%	67%
Windows	--	--	33%
Insulation	--	--	33%
HVAC	--	--	33%
Lighting controls	20	25	--
HVAC controls	20	13	--
Scoping or feasibility studies	20	12	--
Heating	--	13	--
Water reduction	--	13	--
Vent miser	--	12	--
Motors	--	12	--
Propane	20	--	--
Lighting	20	--	--

* Multiple responses

3.7 Satisfaction with the Program

Respondents were asked to rate their satisfaction with the C&I Custom program overall and with various aspects of the program. In contrast to 2008 and 2009, 2010 respondents reported relatively lower levels of satisfaction with the program. Nearly eight out of ten 2010 respondents said that they were satisfied with the program overall, with more than one-half of the respondents (54%) reporting they were ‘very satisfied,’ similar to the responses of 2008 and 2009 respondents. Fewer than one-half of respondents said they were satisfied with interaction and communication with program staff (47%), interaction and communication with contractors or consultants (33%), or the list of available consultants (45%). This may indicate that as the program has continued to expand, it has not been able to maintain the same high level of interactions with each customer. (Table 3-8)¹¹ In contrast to the relatively lower levels of satisfaction found in 2010, one participant interviewed said that the DSM Administrator’s programs were a “*breath of fresh air,*” and that, in contrast, he has “*found it challenging to work with the programs in other Atlantic provinces.*”

Table 3-8: Participant Satisfaction with Program*

Program Aspect	2008		2009		2010	
	<i>n</i>	% Satisfied	<i>n</i>	% Satisfied	<i>n</i>	% Satisfied
Program overall	11	91%	13	100%	13	77%
Interaction and communication with program staff	11	82%	12	100%	13	47%
Availability of program staff	11	91%	12	92%	12	66%
Interaction and communication with contractors/consultants	9	100%	12	75%	12	33%
Initial confirmation of eligibility	11	100%	13	92%	12	66%
List of available consultants	6	84%	5	80%	11	45%
Preliminary energy audit/scoping study	6	84%	9	90%	12	59%
Preliminary energy audit/scoping study rebate amount	9	89%	11	91%	12	83%
Feasibility study/assessment	7	100%	12	84%	13	70%
Feasibility study/assessment incentive amount	7	100%	12	100%	12	83%
Project implementation	8	76%	10	90%	12	66%
Project rebate amount	10	90%	10	100%	13	77%
Verification	7	86%	9	78%	12	75%

* Those giving a rating of 5 or 4 on a scale where Rating: 5= ‘very satisfied’ and 1 = ‘not at all satisfied’

¹¹ The detailed responses are provided in Appendix B.

3.8 Organizational Decision-Making

More than four out of five 2010 respondents (85%) reported that someone outside their organizations was most responsible for specifying the measures that were installed through the C&I Custom program—design professionals (46%) and contractors (23%) were cited most often, similar to 2008 and 2009 respondents. (Table 3-9)

Table 3-9: Party Most Responsible for Specifying Measures - Participants

Measure Implemented	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
Design professional	18%	46%	46%
Contractor	36	31	23
Manufacturer representative	18	8	8
Someone within the organization	18	8	8
Utility account manager	9	--	8
Don't know	--	7	8

3.9 Firmographics

Respondents were asked to rate the importance of reducing energy usage and managing energy costs to their organization on a scale of one to five, where one equaled 'not at all important' and five equaled 'very important.' 2010, 2009 and 2008 respondents provided similar responses to these questions. Nine out of ten 2010 respondents (92%) reported that both reducing energy usage and managing energy costs were important to their company or organization. (Table 3-10)¹²

Table 3-10: Importance of Energy (% Very or Somewhat Important)*

	2008	2009	2010
<i>Sample size</i>	11	13	13
Reducing energy usage	100%	92%	92%
Managing energy costs	100%	92%	92%

* Those giving a rating of 5 or 4 on a scale where Rating: 5= 'very important' and 1 = 'not at all important'

¹² The detailed responses are provided in Appendix B.

About four out of five 2010 respondents (81%) reported that energy costs accounted for 20% or more of their annual operating budgets. On average, energy costs accounted for 37% of annual operating budgets for respondents.

Table 3-11: Energy Costs as a Percent of Annual Operating Budget

	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	8	11
Less than 10%	50%	62%	9%
10-19%	17	12	9
20-29%	17	12	18
30-39%	17	--	9
40-49%	--	12	9
50-59%	--	--	27
60-69%	--	--	18
70-79%	--	--	--
80-89%	--	--	--
90-99%	--	--	--
Average	12%	12%	37%

Slightly more than one-half of 2010 respondents were sports facilities (54%). Manufacturing was the second most common business type at 15%. (Table 3-12)

Table 3-12: Business Type

	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
Sports facility	0%	8%	54%
Manufacturing	9	39	15
Retail	45	23	8
Education	9	--	8
Fire station and civic center	--	--	8
Food sales (grocery)	--	--	8
Cold storage/refrigeration	18	--	--
Industry – mining/saw mill/foundry/metal distribution	9	--	--
Warehouse and storage	9	--	--
Enclosed and strip malls	--	8	--
Distribution	--	8	--
Hospital	--	8	--
Heavy equipment repair	--	8	--

About one-half of the 2010 respondents (55%) reported having facilities with more than 10,000 square feet of floor space, while only 8% of participants reported having more than 100,000 square feet of floor space. (Table 3-13)

Table 3-13: Building Floor Space

Square meters (square feet)	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
93 or less (1,000 or less)	0%	0%	8%
93 to 463 (1,000 to 4,999)	--	--	16
465 to 929 (5,000 to 9,999)	--	16	15
930 to 4,645 (10,000 to 49,999)	27	46	39
4,646 to 9,290 (50,000 to 99,999)	27	15	8
Over 9,290 (Over 100,000)	46	8	8
Don't know	--	15	8

In contrast to 2008 and 2009, two-fifths of 2010 respondents (61%) reported having fewer than 10 employees. (Table 3-14)

Table 3-14: Full-time Equivalent Workers

	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
Fewer than 5	0%	0%	46%
5 to 9	--	15	15
10 to 19	9	--	--
20 to 49	18	23	8
50 to 99	27	15	--
100 to 249	9	8	23
250 or more	36	31	--
Don't know	--	8	8

The majority of the 2009 respondents (69%) reported that their businesses were part of a larger company. (Table 3-15)

Table 3-15: Type of Company

	2008 Respondents	2009 Respondents	2010 Respondents
<i>Sample size</i>	11	13	13
Independent	18%	15%	54%
Part of a larger company	82	69	39
Government	--	8	--
Non-profit	--	8	8

Appendix A Individual On-Site Reports

Technical Note on Stratified Ratio Estimation

The on-site engineering assessment used engineering analysis and surveys to derive the gross savings estimates for each individual sample participant. In turn, the statistical analysis combines these gross savings estimates for the sample participants with their tracking system counterparts in a stratified ratio estimation framework to produce the independent estimates of gross program impacts, i.e., annual energy savings. Case weights developed at the time of the sample design are updated, if necessary, and used to develop the population weighted estimates of the total gross savings and net savings. The case weights are defined for each sample point based on the number of participants in the population (N) represented by each sample point (n). Therefore, the case weights are defined as $(w_k)=N_h/n_h$. The equations for the combined stratified ratio estimator are presented below:

$$\begin{aligned}\hat{Y}_{ra} &= b\bar{X}, \text{ where} \\ b &= \frac{\bar{y}}{\bar{x}} \\ \bar{y} &= \frac{1}{N} \sum_{k=1}^n w_k y_k \\ \bar{x} &= \frac{1}{N} \sum_{k=1}^n w_k x_k \\ \hat{N} &= \sum_{k=1}^n w_k\end{aligned}$$

This first set of equations present the population estimate of y, e.g., the gross annual savings as beta times the population tracking system estimate of savings, namely, $b\bar{X}$. The beta coefficient (b) is the ratio of weighted mean y to weighted mean x, where y is the engineering estimate of savings derived from the on-sites and x is the tracking system estimate of savings. Next, we present equations for the weighted mean estimate of y, the weighted mean estimate of x and the estimate of N, i.e., the number of projects in the population. Equations for the confidence interval of the estimate, the estimated variance, the within-stratum variance of the sample residual, e, and the sample residual are presented below:

$$\begin{aligned}\hat{Y}_{ra} &\pm 1.645 \sqrt{V\left(\hat{Y}_{ra}\right)} \text{ where} \\ V\left(\hat{Y}_{ra}\right) &= \sum_{h=1}^H N_h^2 \left(1 - \frac{n_h}{N_h}\right) \frac{s_h^2(e)}{n_h} \\ s_h^2(e) &= \frac{1}{n_h - 1} \sum_{k \in S_h} (e_k - \bar{e}_h)^2 \\ e_k &= y_k - bx_k\end{aligned}$$

Next, the relative precision of the estimate $\hat{Y}_{ra}$ was calculated using the equation:
$$rp = \frac{1.645 \sqrt{V\left(\hat{Y}_{ra}\right)}}{\hat{Y}_{ra}}$$

Project ID: C-4142145-1

1.0 Facility Overview

This is a grocery distribution warehouse. The main areas of the facility include offices, loading docks, and extensive warehouse floor space. The distribution center operates 24-hours per day on Mondays through Fridays and from 5 am until 7 pm on Saturdays. Sunday operation in the warehouse does not begin until 6 pm. Office operations can start as early as 6 am and last until 7 pm during weekdays. The facility is heated with #2 fuel oil. Offices are air-conditioned with packaged rooftop equipment.

2.0 Summary of Savings and Adjustments

New lighting systems were installed throughout the facility. HID fixtures were replaced in the warehouse and loading docks. Office fluorescent fixtures were rebuilt with efficient lamps and ballasts. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 7.01% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 6.9% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	Customer Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	1,052,416	979,697	-72,719	134.5	116.8	-17.7
Interactive Lighting	5,485	6,379	894	0.0	2.7	2.7
Total Savings	1,057,901	986,076	-71,825	134.5	119.5	-14.9

	Generator Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	1,127,137	1,049,255	-77,882	144.0	125.1	-18.9
Interactive Lighting	5,875	6,832	956	0.0	2.9	2.9
Total Savings	1,133,012	1,056,087	-76,925	144.0	128.0	-16.0

3.0 Project Overview

Table 2 and Table 3 below provide overviews of the installed and removed fixtures respectively:

Table 2: Summary of Installed Fixtures

Fixture Type	Quantity	Fixt. Wattage
6 Lamp T8	47	210
6 Lamp T8 w Occ Sensors	305	210
T8	107	48
T8	6	50
T8	296	97

Table 3: Summary of Removed Fixtures

Fixture Type	Quantity	Fixt. Wattage
250W HPS 347V	126	295
400W HPS 347V	221	465
400W MH 347V	5	450
T12 1*4 120V	6	45
T12 2*4 120V	296	168

The project had not been completed at the time of the site visit. Twenty seven HID fixtures were still in place across different areas of the warehouse and loading dock areas. Safe access to the fixtures was the primary reason for partial installation. The site contact was working with the installers and was confident that the work would be finished. Further investigation shows that the installation contractor had returned to the site since the site visit and had completed the installation.

The data in Tables 2 and 3 was derived from the information provided in the calculation spreadsheet. These tables show the equipment that was reviewed and identified in the field. Fixture types with no quantities could not be identified in the field. The summary for the removed fixtures, the baseline systems, provides detailed fixture descriptions but not lamp/ballast configurations. Unfortunately, baseline fixtures were removed during installation and could not be used to confirm the pre-existing condition.

The summary of installed fixtures is comprised of two fixture designations – 6-lamp T8 and T8. The 6-lamp fixtures replaced HID lighting in high-bay areas. The T8 designation was applied to all remaining fluorescent conversions. It was difficult to match on-site fixture counts with the installed data. The only variable for the installed equipment is fixture wattage. The designations in the baseline refer to fixture type. The label “T12 1*4” refers to a 1X4 fixture containing T12 lamps. The unit may consist of one or two lamps and be an open industrial strip fixture, a surface mounted unit, or a recessed enclosed troffer. Two lamp U-tube fixtures were inventoried in offices and hallways. Two-lamp and four-lamp fixtures were also present. Conversions from eight-foot T12 can include two or four T8 lamps installed in the eight foot troffer.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and general location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group’s location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i}) h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1000 = Wh to kWh conversion factor.

No loggers were installed to monitor operating hours. The project had only been recently completed and that measurement process had yet to be implemented. The annual operating hours listed in the spreadsheet were reviewed and discussed with facility personnel. These values were considered appropriate and retained for the evaluation.

Interactive cooling savings were also claimed for space conditioned areas of the facility. Since the new fixtures operate at lower wattages, and thus impart less heat to the building, they result in cooling savings in the summer months.

The interactive cooling savings were calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_h f_s}{COP} \quad (2)$$

where,

$E_{S-inter}$ = Interactive effects savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_h = Heat gain factor (fraction of the lighting energy assumed to become a load on the space)

f_s = Seasonality factor (fraction of the year assumed to require cooling)

COP = Coefficient of performance of the cooling system.

While the dock and warehouse spaces were not cooled, the office space was cooled by DX equipment. A 2.7 COP was assigned to cooling equipment and the cooling season was estimated at 33% of the annual lighting operating hours. A heat gain factor of 0.208 was used in the spreadsheet. An electric heating penalty was not assessed for this facility as it is heated by #2 fuel oil.

5.0 On-Site Methodology

A detailed lighting inventory was performed with facility personnel. The site contact was familiar with the project and also coordinated the site visits with the installation contractor. The site contact confirmed the operating hours of the facility and concluded that the operating hours used in the calculations were applicable. Remaining baseline fixtures were identified and he was confident that the work would be completed. Heating and cooling equipment was discussed and the use of #2 fuel oil and packaged rooftop equipment in the offices was confirmed.

6.0 On-site Observations and Findings

The lack of detail in the baseline and installed equipment descriptions made a one-for-one comparison of the installed equipment difficult. An inventory was taken of the lighting systems. Twenty-seven baseline HID fixtures were still in place during the site visit. These fixtures have since been removed and replaced with the 6-lamp T8 fixtures consistent with the remainder of the warehouse project. The lighting tables and verification of savings have been modified to reflect the work done since the site visit was conducted. The inventory of the office lighting resulted in finding seven fewer fixtures including 1X8, 1X4, and 2X2 fixture types.

The savings calculations also used incorrect wattage for one fixture type. The 250-Watt high pressure sodium fixtures were rated at 465-Watts in the baseline system. This was changed to 295-Watts in the evaluation.

7.0 Conclusions

Annual energy savings were 93.1% of the tracking savings. The savings variance is due to the reduction in fixture quantity. Forty-seven baseline HID fixtures were reduced by 270-Watts each in the baseline calculations. Customer demand savings were 17.7 kW [13.1%] lower than tracking estimates. This variance is also due the modifications discussed above. The variance in Generator demand savings is 18.9 kW [13.1%]. An additional 2.7 kW of demand savings were obtained from interactive cooling. These units operated at reduced loads achieving the increased demand reduction. A 1.071% loss adjustment factor was applied to interactive savings to obtain the generator demand savings.

Project ID: C-78507-1

1.0 Facility Overview

This facility is a hardware store. The store consists of a first floor retail shopping area, a basement storage area, a shipping office, and a second floor office area. The store is open for business from 7 AM to 7 PM Monday through Wednesday, 7 AM to 8 PM Thursday through Friday, 8 AM to 6 PM Saturday, and 10 AM to 5 PM Sunday. Employees typically arrive and leave the facility 15 minutes before opening and 30 minutes after closing respectively.

2.0 Summary of Savings and Adjustments

This project consisted of lighting renovations in the retail, basement, and shipping areas of the facility. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on-site verification of equipment installation and a review of the program documentation and analysis. Customer savings refer to energy and demand savings at the site. Generator savings were increased by 7.1% relative to customer savings to account for transmission and distribution losses. The evaluated customer savings were 25% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	32,694	24,360	-8,334	3.7	5.2	1.5

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	35,015	26,090	-8,926	4.0	5.6	1.6

3.0 Project Overview

This facility undertook an extensive retrofit of their interior lighting. The measures undertaken were as follows:

- Replace 2L 4' T12 (120W) and 2L 8' T12 (68W) fixtures with 2L (48W) and 4L (98W) low wattage T8 fixtures.
- Replace metal halide (457W) fixtures with 6L T8 (221W) high bay fixtures.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. In the context of the spreadsheet, the lighting retrofit was split into groups of lights installed in various areas of the store. For each area, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given store area were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that area. Savings from each store area were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_s = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i})h}{1000} \quad (1)$$

where,

E_s = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Store area i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor.

Operating hours for the basement, main entry, and part of the sales floor were calculated from lighting logger data collected over a 6 week long period in the spring and summer of 2010. Operating hours for the remainder of the store were likely calculated from data provided by the site contact.

No interactive savings were claimed for this project since the facility does not have air conditioning and heating is provided by #2 furnace oil.

Peak demand savings were calculated by multiplying the gross connected load reduction by a peak coincidence factor of .75. The peak coincidence factor was chosen based on the assumption that there was a 75% chance that the retail store was open during the NSPI defined weekday peak period of 5 PM to 6 PM.

5.0 On-Site Methodology

During the site visit, the installation of all proposed fixtures was verified. Lamp types were verified where possible, but extra ballasts were not available to confirm claimed fixture wattages. The primary site contact was interviewed to confirm that the appropriate baseline lighting systems were included in the savings calculation and that the lighting hours of operation included in the savings calculation were correct.

6.0 On-site Observations and Findings

The fixture types found on-site matched those listed in the application. The quantities, however, were slightly different. Table 2 below compares the fixtures found on-site with the fixtures specified in the tracking savings analysis.

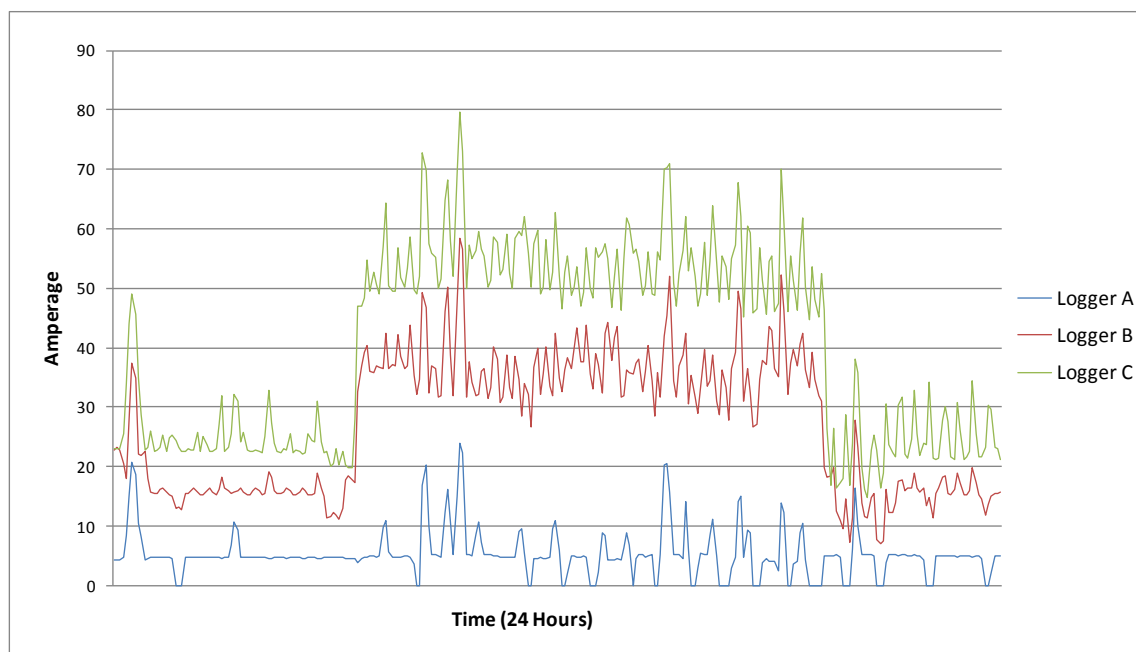
Table 2: Comparison of Tracking and Evaluation Verified Fixture Counts

		<i>Tracking Counts</i>	<i>Verified Counts</i>
Main Store	4L T8 4' 28W	28	28
	2L T8 4' 28W	0	2
Basement	4L T8 4' 28W	30	32
	2L T8 4' 28W	1	1
Renovation Area	6L T8 4' 28W	8	8
	4L T8 4' 28W	24	24
	2L T8 4' 28W	0	1
Main Entry	6L T8 4' 28W	16	16

The site contact was able to explain the presence of two additional 4L fixtures in the basement. He stated that after the project had been completed, the lighting levels were still too low in one small area, so two additional fixtures were added. Reasons for the other small discrepancies were not identified.

The amperage data collected during the implementation M&V was also reviewed. A total of five amperage loggers were installed. Each logger recorded data in five minute intervals. Data time stamped from 12 AM on 5/28/10 until 12 AM on 7/9/10 were used in the implementation analysis.

For each logger, amperage readings greater than 1A were considered “on” readings. In the context of the M&V analysis, “on” readings implied that all lights on a given circuit were illuminated at that time stamp. This approach would have been fine if all lights on a given circuit turned on simultaneously. However, a review of the metered data during the evaluation analysis revealed that not all lights on a typical metered circuit turn on concurrently. Furthermore, investigating a random day of logged data from the three basement circuits revealed that the monitored circuits probably also serve non-lighting loads.

Figure 1: Metered Amperage Data from 6/2/2010

In Figure 1, notice for loggers B and C, using 1A as an “on” indicator overestimates lighting usage since the circuit load is variable. In reality, a fraction of lights appear to have been on in the morning and evening (most likely emergency lights), and all of the lights appear to have been on during the day. The significant noise in this data set, which is atypical of lighting circuits, indicates that other loads besides lighting were also likely monitored. Notice that large simultaneous spikes in amperage occurred across all three circuits, suggesting that there may be three phase loads on these particular circuits. The evaluator’s suspicions regarding additional monitored loads could not be confirmed during the site visit because these issues was not identified until the data had been collected and analyzed after the site visit. The significant variability in the data was deemed a notable enough issue to warrant revisiting the way operating hours were calculated from the amperage data.

For the evaluation analysis, the logger data were “cleaned” by identifying the minimum current reading in that hour and assuming that it represented the lighting loading in that hour. By using this approach, it was implicitly assumed that the large base loads in Figure 1 were from lighting; additional spikes riding on top of the base loads were believed to be from other end uses.

Using the cleaned data, an average load factor was calculated for each circuit. To generate a load factor for a given circuit, the peak metered amperage was first determined. Next, each “on” hourly amperage reading was divided into this peak value to calculate the load factor for each hour. The load factors from each hour were then averaged to yield a load factor for the entire metering interval. This load factor was then multiplied by the operating hours in Equation 1 to scale the lighting hours to “Equivalent Full Load Lighting Hours.”

Data from the basement loggers (B and C) and the “Main Entry” and “Renovation” area loggers were cleaned and used to update the operating hours in their respective areas of the store. Data from logger A (Figure 1) were discarded for the evaluation analysis primarily because the recorded data exhibit load

spikes in excess of the apparent base load. Furthermore, the circuit load on logger A was so minimal that it represented an insignificant amount of the installed lighting load. Operating hours for unmonitored areas of the store were not adjusted because the store hours provided by the contact coincided well with the values used in NSPI's M&V analysis.

After updating the lighting operating hours, a final issue was identified with the M&V analysis spreadsheet. Connected load values for the preexisting fixtures were rounded to one significant digit unnecessarily. For instance, 10 457W MH fixtures were input as a 5 kW connected load, when in reality they represented a 4.57 kW connected load. When multiplied by an 8,569 hour annual schedule, this .43 kW difference in connected load yielded a significant change in savings. These rounding errors were corrected for the evaluation analysis.

To assess peak demand savings, peak coincidence factors were first calculated for each monitored circuit. Peak coincidence factors were determined by averaging hourly load factors (discussed above) for all peak hours (weekdays from 5 PM to 6 PM) during the monitoring interval. The peak coincidence factors were then multiplied by the connected load reductions in the corresponding lighting areas to generate peak demand savings. In the unmonitored areas of the store, a peak coincidence factor of unity was assumed based on the site contact's claim that the store is open continuously during the peak period. Peak demand savings for all lighting areas were summed to generate gross peak demand savings.

7.0 Conclusions

Annual energy savings were 74.5% of the tracking savings. Factors contributing to the reduction in savings relative to the tracking value included,

- The difference between the verified fixture counts and tracking fixture counts. Since more fixtures were found on-site than originally claimed in the tracking analysis, the savings were slightly reduced.
- Improperly used logger data. As discussed previously, logger data were used in such a way that neglected the possibility that not all lights on a circuit would be used simultaneously. This approach effectively overstated operating hours for each of the logged lighting circuits.
- The baseline connected load values in the tracking analysis were unnecessarily rounded. Rounding biased the baseline fixture wattages high, thus inflating savings.

Peak demand savings were 140.2% of the tracking estimate. Peak demand savings exceeded tracking savings primarily because DSM Administrator staff had not updated the tracking system with the results of their M&V analysis. While the tracked energy savings were properly updated with M&V results, the demand savings in the tracking system reflected savings from the Project Development Agreement (PDA) analysis. If the tracking system demand figures had been updated with the M&V results, the demand savings realization rate would have decreased considerably to 106.8%. Even then, the peak demand savings would have been greater than initially predicted primarily because the load weighted average peak coincidence factor using in the evaluation analysis (.96) was larger than the peak coincidence factor using in the M&V analysis (.75).

Project ID: C-96882-2

1.0 Facility Overview

This lighting project was installed across six different buildings and locations. These are food processing and packaging plants. Main areas included in this project are the production areas, packaging, receiving and shipping, mechanical spaces, storage areas, and offices. Parts of the plant have seasonal operation. These hours coincide with growing seasons and product availability. These areas accommodate less than 20% of total floor area. The remainder of the plant has continuous operations. Heating is provided by #2 oil with some electric resistance and infrared gas heaters. Offices operate from 50 to 70 hours per week depending upon location. Direct expansion cooling equipment provides space cooling. Ammonia chillers are used for refrigeration at the site.

2.0 Summary of Savings and Adjustments

An extensive lighting retrofit was completed in the facility. Lighting systems in production areas, packaging, receiving and shipping, mechanical spaces, storage areas, and offices were replaced. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 4.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 4.7% greater than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	749,636	784,996	35,360	54.3	72.8	18.5
Interactive Lighting	13,022	13,701	679	0.0	4.7	4.7
Total Savings	762,658	798,697	36,039	54.3	77.5	23.2

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	780,371	817,181	36,810	56.5	75.8	19.3
Interactive Lighting	13,556	14,263	707	0.0	4.9	4.9
Total Savings	793,927	831,444	37,516	56.5	80.7	24.2

3.0 Project Overview

Table 2 and Table 3 below provide overviews of the installed and removed fixtures respectively:

Table 2: Summary of Installed Fixtures

	Fixture Type	Quantity	Fixt. Wattage
Appetizer Plant	4 lamp T8 plus	98	128
Appetizer Plant	4 lamp T5 HO	4	216
Appetizer Plant	6 lamp T5 HO	105	324
Plant #2 and #10	400 MH [Original]	2	450
Plant #2 and #10	6 lamp T5 HO	162	324
3 Plant #1	2 Lamp T8 plus	26	64
3 Plant #1	2 lamp T8	20	64
3 Plant #1	4 lamp T8	2	128
3 Plant #1	4 lamp T8 plus	7	128
3 Plant #1	6 lamp T5 HO	53	324
3 Plant #1	6 lamp T8 plus	34	192
4 Halfway River	2 lamp T8	89	64
4 Halfway River	4 lamp T8	14	128
4 Halfway River	6 lamp T8 plus	30	192
Hillaton N.S.	2 lamp T8	4	64
Hillaton N.S.	3 lamp vT T8	4	96
Hillaton N.S.	6 lamp T5 HO	71	324
Hillaton N.S.	6 lamp T8 plus	13	192
Stores	2 lamp T8	8	64
Stores	2 lamp T8	88	64
Stores	6 lamp T8	17	192
	Total	851	208.5 Avg kW

Table 3: Summary of Removed Fixtures

	Fixture Type	Quantity	Fixt. Wattage
3 Plant #1	T12(4)	20	75
3 Plant #1	T12(2)	26	75
4 Halfway River	T12 8'	14	173
4 Halfway River	T12	89	75
Stores	8' T-12 2L strip	60	138
3 Plant #1	75HPS	2	90
Hillaton N.S.	75HPS	4	95
Appetizer Plant	400MH	101	450
Plant #2 and #10	400MH	164	450
3 Plant #1	400MH	87	450
4 Halfway River	400MH	26	450
Hillaton N.S.	400MH	83	450
Stores	400MH	21	450
Hillaton N.S.	400HPS	1	450
Appetizer Plant	250MH	100	290
3 Plant #1	250MH	7	290
4 Halfway River	250MH	4	290
Hillaton N.S.	150HPS	4	175
	Total	813	334.1 Avg kW

Fixture types and wattages for the pre-existing fixtures were taken at face value since pre-existing fixtures were unavailable for verification at the time of the evaluation-site visit. The quantities of fixtures in the tables reflect inventories found at the site. The variance in the fixture quantities is linked to the Stores location where 8' fixtures were replaced with 4' T8 lamps and ballasts.

A total of 851 fixtures were installed in this project with a total connected load of 177.4 kW. Site inventories and analyses were performed at five of the seven locations. These locations represent 20% of the total connected [35.5 kW] load of the project. Installation and operation of these sites were discussed with site personnel familiar with the lighting project.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i}) h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

Logger information and trend logs were provided in the tracking documentation. These loggers covered office areas and the reel room. Pivot tables were created from the trend data for the monitoring period specified in the logger analysis spreadsheet. This data generated a weekly operating profile which was annualized. The data from the pivot tables closely matched the operating hours stated in the reports. Operation by space and location were reviewed and confirmed by site personnel.

Interactive cooling savings were also claimed for space conditioned and refrigerated areas of the facility. The new fixtures operate at lower wattages. This results in less waste heat generated by the lighting systems. This reduction in waste heat slightly increases heating costs. Air conditioning loads are reduced resulting in lower cooling costs. The new lighting systems provide additional refrigeration savings for the entire year.

The cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_h f_s}{COP} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_h = Heat gain factor (fraction of the lighting energy assumed to become a load on the space)

f_s = Seasonality factor (fraction of the year assumed to require cooling)

COP = Coefficient of performance of the cooling system.

A heat gain factor of 0.156 was used for areas with electric heat. The cooling heat gain factor is 0.208.

A 1.0 COP was assigned to all cooling and refrigeration equipment at the sites. The improvement in lighting efficiency reduced the waste heat generated by the system. This reduction in waste heat equals a reduction in the loads on the cooling and refrigeration equipment. Interactive refrigeration savings was applied to 100% of the annual lighting operation. The cooling season was estimated at 22% of the annual lighting operating hours.

Electric heating energy penalties were calculated for areas with electric resistance heating. Heating systems have to make up the difference in waste heat resulting in higher heating operation. Two heat adjustment factors, 0.156 and 0.208, were used in the calculations. These factors are applied to the

difference in total connected load between the base and installed system. Applying these factors estimates load that is lost as waste heat. Heating operations were estimated at 100% of the year.

Peak demand savings were calculated by applying system peak coincidence factors to individual lighting loads defined by location and operation. These adjustment factors ranged from 41.8% to 97.0%. Interactive effects added 4.7 kW to demand savings. The cooling equipment operated with a reduced load due to the reduction in waste heat. The electric resistance heating operated at slightly greater loads, affecting demand savings.

5.0 On-Site Methodology

The installation of the new lighting equipment was discussed with site personnel. The areas identified in the tracking files were reviewed along with the baseline equipment and operation. The site contact agreed with the baseline assumptions. The stated lighting hours were in line with the operation in his facility. Heating, cooling, and refrigeration equipment was discussed and observed in the field. Two locations were not visited that were included in tracking savings. The fixture information for the two locations not visited was discussed with site personnel. They had complete invoices for the project by location and confirmed that their data matches the tracking inventories. While not conclusive, this provided some insight to the work done at those locations.

A detailed walk through was performed. The fixture types and quantities in the field were matched to the corresponding inventories from the tracking documents. There was some difficulty in exactly matching fixture quantities in the tracking spreadsheets to the site counts. These are large open areas and the boundaries that separate sections are not often clear. The total fixture count taken on-site match closely with the tracking estimates. A complete lighting inventory was performed of all fixtures according to general usage along with the fixture type. Annual lighting operation was also obtained for each location. The savings re-creation spreadsheet was populated from the collected data.

6.0 On-site Observations and Findings

The tracking savings are based upon 837 fixtures installed in the facility. The site visits inventoried 851 fixtures which is 14 more than the tracking. One less 4-lamp T8 fixture was found in a receiving area. Also, two additional 4-lamp T8 and four 6-lamp T8 fixtures were inventoried in the production and packaging spaces. Two 400-Watt metal halide fixtures remain in the tote area of plant 2. Access is an issue and staging needs to be constructed to replace the units. The work will be completed but no firm time frame exists. Fixture variances in plant 3 include 14 more 2-lamp T8 units in the key area and five less 6-lamp T8 fixtures in the engine room. Fixture counts matched in one location. However, eighteen 6-lamp T5 fixtures were specified for production and fork lift areas and six 4-lamp T5 fixtures were to be installed in the fork lift area and barn. These fixtures are equipped with T8 lamps and ballasts and are not T5 equipment. Site personnel confirmed the change.

The cooling and refrigeration equipment was also reviewed for interactive savings. Tracking calculations make no differentiation between air-conditioned and refrigerated spaces. Interactive space cooling savings are calculated using a COP of 1.0. This value is too low and reflects very inefficient equipment. The site has a large ammonia refrigeration plant. Loads in freezers are continuous and year round. A 1.75 COP was assigned to all refrigeration and a 3.0 COP was applied to space cooling loads.

Interactive heating penalties were generated for this project. Electric resistance heating exists in offices and some equipment spaces. Some areas are heated by infrared radiant system. These units operate by

heating objects and people under them and not by directly heating air. Heating penalties do not pertain to these systems.

7.0 Conclusions

Annual energy savings were 104.7% of the tracking savings. Changes in the fixture counts and type added 4,624 kWh to total savings. The variance in fixture quantities is small. Installing the 6-lamp T8 fixtures in place of the 6-lamp T5 units in one smaller location meant a 132 Watt per fixture improvement in performance. Savings were marginally reduced by retaining the two 400-Watt metal halide fixtures in a work room.

The heating penalty in the tracking savings was 82,022 kWh per year. This was reduced to 30,017 kWh in the site evaluation. The reduction in the penalty comes from eliminating the interaction in spaces that are heated by radiant heat or fuel oil.

Cooling savings were 97,427 kWh per year in the tracking savings. These savings were reduced to 45,587 kWh per year. This reduction comes from correcting the COP used in the calculations. All interactive cooling savings were based upon a COP of 1. A COP of 1.75 was applied to refrigerated areas and a 3.0 COP was used for areas containing DX equipment.

Peak demand savings were 142.8% of the tracking estimate. This variance reflects again the influence of the additional fixtures and changes in equipment type. Interactive heating and cooling effects added 4.7 kW to peak demand savings. The 1.040 loss adjustment factor was applied to the interactive demand savings to estimate generator demand savings.

Project ID: C-269742-1

1.0 Facility Overview

This facility is a new fire hall and civic center for a community in rural Nova Scotia. The main two-story, 8,000 square foot fire hall contains offices, a dispatch room, a locker room, a training room, a game room, a workout room, a lounge, washrooms, and mechanical and electrical rooms. Abutting the fire hall is an approximately 8,000 square foot garage with five fire truck bays. On the other side of the building sits a 7,000 square foot civic center consisting of a main meeting hall, a kitchen, offices, washrooms, a mechanical room, and storage rooms.

Outside of emergency situations, the fire hall is typically occupied by one person from 8 AM to 5 PM Monday through Friday. A firefighter typically works on Saturdays from either 8 AM to 12 PM or 12 PM to 4 PM. The fire hall is generally unoccupied on Sundays. The civic center normally has a single occupant on weekdays between 1 PM and 5 PM. Saturdays often see near full occupancy when the civic center holds parties, weddings, remembrance services, seminars, and other events. A typical weekend event runs from 4 PM on Saturday to 1 AM on Sunday. The civic center is generally unoccupied on Sundays.

2.0 Summary of Savings and Adjustments

This project consisted of three distinct measures. First, occupancy sensor lighting controls were installed in all washrooms, as well as the fire hall locker room. Second, two high efficiency ground source heat pumps (GSHP) were installed to reduce heating and cooling energy consumption relative to baseline packaged HVAC units and electric baseboard heat. Lastly, exterior wall and roof insulation levels were increased relative to the Model National Energy Code (MNEC) to minimize heat loss during the winter and heat gain during the summer months.

Savings were recalculated for the evaluation using new as-built and baseline energy models of the facility generated with *eQuest*, a front end modeling tool running on the DOE2.2 simulation engine. Table 1 below presents a summary of the energy and demand savings calculated for the tracking and evaluation analyses. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus an 11.3% scale factor to account for transmission and distribution losses. The gross evaluated energy savings were ultimately 1.6% more than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	Customer Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	4224	1800	-2424	0.5	0.0	-0.5
HVAC	166049	217821	51772	19.0	3.2	-15.8
Insulation	52016	6317	-45699	6.0	0.1	-5.9
Total	222,289	225,939	3,650	25.5	3.3	-22.2

	Generator Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	4,701	2,004	-2,697	0.5	0.0	-0.5
HVAC	184,813	242,435	57,623	21.1	3.6	-17.5
Insulation	57,894	7,031	-50,863	6.7	0.1	-6.6
Total	247,408	251,470	4,062	28.4	3.7	-24.7

3.0 Project Overview

As mentioned in Section 2.0, this project consisted of lighting, HVAC, and building shell measures. The lighting component of the project, which was relatively small from an energy savings perspective, consisted of installed occupancy sensors in three sets of men's and women's washrooms in addition to the fire hall locker room. These occupancy sensors reduce the operating hours of roughly 2 kW of lighting. The baseline condition for this measure was same lighting without occupancy sensors.

The mechanical component of the project included two 25-ton (nominal) GSHPs. These two heat pumps are piped to in-slab hot water loops providing radiant space heating to all areas of the building, including the garage. The heat pumps also supply a chilled water loop piped to five fan coil units distributed throughout the fire hall and civic center. The installed heat pumps are rated at 26.66 tons for cooling with an EER of 21.6 when the ground loop entering condenser temperature is 64 °F and the leaving chilled water temperature is 46.1 °F. In heating mode, the units each output 310.2 kBtu/h with a COPh of 4.15 when the ground loop entering evaporator temperature is 52 °F and the leaving hot water loop temperature is 113.6 °F.

The baseline condition for the HVAC system consisted of packaged roof top AC units rated at 8.5 EER. Space heating was to be provided by electric resistance baseboards. These baselines were selected using the 1997 MNEC minimum compliance requirements.

Aside from the primary heating and cooling equipment, both the installed and base cases consisted of identical sensible heat recovery ventilators. Exhaust fans and ventilation requirements were also consistent between the installed and baseline conditions.

The third measure installed at this facility was improved wall and roofing insulation. Whereas the MNEC calls for overall assembly R-values of R-21 for the roof and walls, the constructed walls and roof achieved R-values of 23 and 31 respectively.

4.0 Tracking Savings Review and Calculations

At the time of program evaluation, the DSM Administrator had not yet had time to complete M&V work for this project. As such, the tracking savings presented for this project are based on the work completed for the Project Development Agreement (PDA).

Savings were calculated for the PDA with the assistance of Carrier Corporation's building energy modeling software, HAP v4.4. HAP was used to model the monthly heating and cooling loads of the fire hall under two shell construction scenarios:

- R10 walls and R20 roofing (baseline)
- R20 walls and R30 roofing (installed).

The building's monthly heating and cooling loads, output in kBTU, were then used to calculate energy savings from the insulation and HVAC measures.

To calculate savings from the insulation measure alone, the load outputs from the baseline and installed case models were used with the baseline heating and cooling equipment efficiencies to calculate energy use for the baseline and installed cases. The difference between the two cases was then calculated to determine insulation measure energy savings. In long form, insulation energy savings were calculated with the following equation:

$$E_{S-insul} = \sum_i^{12} \frac{L_{c-base-i}}{EER_{base}} + \frac{.2931 * L_{h-base-i}}{COP_{hbase}} - \sum_i^{12} \frac{L_{c-inst-i}}{EER_{base}} + \frac{.2931 * L_{h-inst-i}}{COP_{hbase}} \quad (1)$$

where,

$E_{S-insul}$	= Insulation Energy Savings [kWh]
i	= Month
$L_{c-base-i}$	= Baseline building monthly cooling loads [kBtu]
$L_{h-base-i}$	= Baseline building monthly heating loads [kBtu]
$L_{c-inst-i}$	= Installed building monthly cooling loads [kBtu]
$L_{h-inst-i}$	= Installed building monthly heating loads [kBtu]
EER_{base}	= Energy Efficiency Rating of baseline cooling equipment (8.5) [kBtu/kWh]
COP_{hbase}	= Heating Coefficient of Performance of baseline heating equipment (1 for electric resistance heating)
$.2931$	= kBtu to kWh conversion factor [kWh/kBtu].

To determine energy savings attributable to the HVAC measures independent of the insulation upgrades, a similar calculation approach was taken. However, in this case, the baseline building loads were used for both the baseline and the installed cases. The heating and cooling equipment efficiencies were then adjusted to differentiate the baseline and as built cases. Monthly energy consumption was then calculated for both the baseline and installed cases and HVAC energy savings were simply the difference between the two cases. In equation form, HVAC energy savings were calculated as follows:

$$E_{S-HVAC} = \sum_i^{12} \frac{L_{c-base-i}}{EER_{base}} + \frac{.2931 * L_{h-base-i}}{COPh_{base}} - \sum_i^{12} \frac{L_{c-base-i}}{EER_{inst}} + \frac{.2931 * L_{h-base-i}}{COPh_{inst}} \quad (2)$$

where,

E_{S-HVAC} = HVAC Energy Savings [kWh]

i = Month

$L_{c-base-i}$ = Baseline building monthly cooling loads [kBtu]

$L_{h-base-i}$ = Baseline building monthly heating loads [kBtu]

EER_{base} = Energy Efficiency Rating of baseline cooling equipment (8.5)
[kBtu/kWh]

$COPh_{base}$ = Heating Coefficient of Performance of baseline heating
equipment (1 for electric resistance heating)

EER_{inst} = Energy Efficiency Rating of installed cooling equipment (20)
[kBtu/kWh]

$COPh_{inst}$ = Heating Coefficient of Performance of installed heating
equipment (3.12)

$.2931$ = kBtu to kWh conversion factor [kWh/kBtu].

The calculations in Equations 1 and 2 present the savings from the insulation and HVAC measures as if only one of the measures had been implemented. In practice, they were implemented together, ultimately reducing the net effect of each measure. Therefore, the above analyses were conducted primarily to determine the portion of energy savings attributable to each measure, not the actual energy savings from the project.

To determine total energy savings from implementing both measures simultaneously, a third calculation was performed wherein the baseline (low insulation) building using the baseline HVAC equipment was compared to the as-built building (high insulation) using the installed HVAC equipment. Equation 3 below presents the final savings calculation in long form:

$$E_{S-Total} = \sum_i^{12} \frac{L_{c-base-i}}{EER_{base}} + \frac{.2931 * L_{h-base-i}}{COPh_{base}} - \sum_i^{12} \frac{L_{c-inst-i}}{EER_{inst}} + \frac{.2931 * L_{h-inst-i}}{COPh_{inst}} \quad (3)$$

where,

E_{S-HVAC}	= HVAC Energy Savings [kWh]
i	= Month
$L_{c-base-i}$	= Baseline building monthly cooling loads [kBtu]
$L_{h-base-i}$	= Baseline building monthly heating loads [kBtu]
$L_{c-inst-i}$	= Installed building monthly cooling loads [kBtu]
$L_{h-inst-i}$	= Installed building monthly heating loads [kBtu]
EER_{base}	= Energy Efficiency Rating of baseline cooling equipment (8.5) [kBtu/kWh]
$COPh_{base}$	= Heating Coefficient of Performance of baseline heating equipment (1 for electric resistance heating)
EER_{inst}	= Energy Efficiency Rating of installed cooling equipment (20) [kBtu/kWh]
$COPh_{inst}$	= Heating Coefficient of Performance of installed heating equipment (3.12)
.2931	= kBtu to kWh conversion factor [kWh/kBtu].

After calculating HVAC and insulation energy savings using Equation 3, lighting savings were added to the total to generate gross savings for the entire project. The calculation used to determine lighting savings is unknown, although lighting savings were attributed at a rate of 424.6 kWh per month on the basis of an 80% time of use reduction relative to the baseline lighting without occupancy sensors.

While the tracking analysis approach was generally straightforward and defensible, it was nonetheless flawed. To begin, energy simulation software should have been used to calculate savings in addition to building loads. Because spreadsheets were used to estimate savings, variations in equipment performance (EER and COPh) as a function of load and outdoor conditions were not considered for either the baseline or installed building configurations.

The tracking analysis also used wall and roof R-values differing from those explicitly specified in the feasibility study report accompanying the tracking analysis. The feasibility study called for as-built wall and roofing assembly R-values of 23 and 32 respectively; the modeled building used R20 walls and R30 roofing. Furthermore, the base case specified in the feasibility study included walls and roofing rated at R21; the modeled baseline used R10 walls and R20 roofing.

The tracking analysis also erred on the side of caution by using worst case efficiencies for the installed heat pumps. In particular, the 3.12 COPh used in the tracking analysis corresponds to a ground loop entering evaporator temperature of 28 °F, implying that the ground temperature is in the 30-40 °F range.

In practice, the average ground temperature in Nova Scotia (5+ feet below the surface) is much more likely in the 45-50 °F range. Under these conditions, the heating performance of the system improves dramatically because the heat source (the ground) has more usable energy.

The cooling performance of the installed system was also biased low in the tracking analysis. Instead of assuming a ground loop entering condenser temperature of 64 °F, which corresponds to an EER of 21.6, an entering condenser temperature of 69 °F was used, corresponding to an EER of 20. Given that the ground temperature is probably in the range of 45-50 °F, an entering condenser temperature of 64 °F is more probable during cooling operation.

5.0 On-Site Methodology

An on-site methodology was formulated with the intent of using data collected at the fire hall to construct new simulation models of the proposed and baseline buildings for the evaluation savings calculation. Therefore, the goals of the site visit were to,

- Verify that the proposed HVAC and lighting measures had been installed
- Discuss building operations with the site contacts
- Collect facility plans to assist in modeling the building.

The site visit began by discussing building operations with the current fire chief and the electrical construction coordinator. Occupancy, lighting, and HVAC operating schedules and set points were discussed for each of the building's area. Building plans were then reviewed. Pictures were taken of select architectural, mechanical, and electrical drawings to assist in constructing a new simulation model of the facility. To conclude the site visit, a facility walkthrough was conducted to verify installation of occupancy sensors in proposed locations. Equipment in the mechanical room was also inspected to confirm that it matched the equipment specified in the plans and project documentation. Model numbers and nameplate information were collected from the installed heat pumps, as well as the pumps serving the ground loop, hot water loop, and chilled water loop.

Other plan details, such as the locations of HRVs and fan coils, were also verified to ensure that the building would be modeled properly.

6.0 On-site Observations and Findings

During the site visit, occupancy sensors were found installed in the locker room and in the washrooms as proposed. Two Maritime Geothermal LTD, W-300-HW-R heat pumps were also installed as proposed. The hot water and chilled water loops running off the heat pumps were also identified and operational. With respect to the insulation measures, it was not possible to verify that the walls and roofing had been assembled as proposed since building construction was complete.

To assist in constructing a new energy model, the site contact provided occupancy, lighting and HVAC scheduling data for each of the main building areas. Table 2 below provides a summary of building occupancy and HVAC set points for each of the primary building areas.

Table 2: Summary of Occupancy, Lighting, and HVAC Usage Parameters

<i>Fire Hall</i> Occupancy • Typically occupied by a single firefighter from 8 AM to 5 PM, Monday through Friday • Occupied from either 8 AM to 12 PM or 12 PM to 4 PM on Saturdays • Closed Sundays Lighting • Lights are used only during occupied hours. Even then, lighting use throughout the facility is relatively sparse since only one person occupies the fire hall outside of emergency periods. HVAC • An occupied heating set point of 20 °C is maintained on the second floor • An occupied heating set point of 21 °C is maintained on the first floor • Outside of the occupied hours, the HVAC systems are shut off completely
<i>Garage</i> Occupancy • The garage follows the occupancy schedule of the fire hall Lighting • As with the fire hall, lights are used minimally except in times of emergency. Outside of occupied hours, lights are kept off. HVAC • The garage does not have space cooling. However, it does have two large exhaust fans (7600 CFM total) and matching supply fans that run when vehicles are on to remove exhaust fumes and supply fresh air. • The garage uses in-floor radiant heating. During occupied hours, the garage is kept at roughly 20 °C. • Outside of occupied hours, the heating system is shut off completely.
<i>Civic Center</i> Occupancy • The civic center is typically occupied by a single part time employee from 1 PM to 5 PM, Monday through Friday. • A walking club occasionally uses the civic center for two mornings each week;

however the heating systems are not activated during their occupancy.

- On Saturday, the space is used for functions that typically last from 4 PM until as late as 1 AM on Sunday.
- The civic center is typically unoccupied on Sundays.

Lighting

- Lights are used only during occupied hours. Since only one person is typically working in the civic center during the week, lights are used sparingly during occupied weekday hours.

HVAC

- An occupied heating set point of 18 °C is maintained in the main hall
- An occupied heating set point of 19 °C is maintained in the support areas (kitchen, restrooms, etc.)
- Outside of occupied hours, the HVAC systems are shut off completely.

After discussing building schedules, the site contact provided a set of building plans for review. The main floor plans, as well as the building elevations, were subsequently used to dimension the building model. The reviewed plans also contained mechanical schedules and layouts, which were used to specify HVAC parameters and zone the building during the modeling process. Lastly, the lighting layouts specified in the plans were used to calculate light power densities (LPDs) for all areas of the building model.

Subsequent to the site visit, a new pair of building models was generated using *eQuest*. Both the baseline and as built models were constructed using the building occupancy, lighting, and HVAC scheduling data provided in Table 2. Airside ventilation equipment not directly related to the primary cooling and heating equipment, such as HRVs and exhaust fans, was also modeled equivalently in the baseline and as built models. The baseline and as-built models were differentiated by adjusting the primary cooling and heating equipment, shell insulation values, and lighting run times in areas with occupancy sensors.

Due to the limitations of DOE2.2 modeling software, it was necessary to use a workaround to model the as-built building's primary HVAC equipment. In particular, DOE2 cannot model ground source heat pumps (GSHP) that feed hot and chilled water loops; it can only model direct expansion (DX) GSHPs. As a result, it was necessary to model the installed heat pumps as a pair of chillers for space cooling. The chillers were modeled with an equivalent full load efficiency to the installed heat pumps (21.6 EER). While the part load performance of water-cooled chillers undoubtedly differs from ground source heat pumps, this solution provided the only means of modeling ancillary equipment associated with the installed system, such as the chilled water pumps and the ground source loop pump (modeled as a condenser pump). In addition, this solution provided a method of modeling the air side fan coils as they operate in practice.

To model the in-slab radiant heating system, an electric boiler with a full load COP_h of 4.15 was specified using the part load efficiency curve of a generic GSHP. The in-slab radiant coils were modeled as hot water loop baseboard heaters in zones with air side equipment (supply fans, fan coils, HRVs, etc.). This

modeling approach was necessary because DOE2 does not allow in-slab heating in zones with air side equipment; only baseboard heating is permitted in zones with airside equipment. Even though the dynamics of a GSHP based heating strategy could not be fully captured using this modeling approach, it nonetheless provided the best available means of modeling the hot water loop radiant heating system.

In the base case model, the HVAC systems were modeled using rooftop packaged AC units and electric resistance baseboard heaters as specified in the feasibility study. All cooled zones in the base case model were supplied with packaged systems rated at 8.5 EER. Heating in all zones was limited to baseboard heat. eQuest was allowed to autosize all base case heating and cooling equipment based on building loads.

To capture the effects of the insulation measure, R-values of 23 and 32 were input for the exterior wall and roofing assemblies respectively in the as-built model. Wall and roof R-values were both decreased to 21 in the baseline model to match the specification provided in the feasibility study. To estimate the effect of the occupancy sensor measure, lighting schedules were reduced by 80% during normal hours of operation to match the reduction factor assumed in the feasibility study.

To calculate annual energy savings for all three measures in the aggregate, both the baseline and as-built versions of the model were run using an 8,760 hour annual simulation. The models were run using a weather file for the nearest Typical Meteorological Year (TMY) weather station. Energy savings were simply taken as the difference between the baseline and as-built runs. To determine peak demand savings, the hourly savings from every peak hour throughout the year (5 to 6 PM on non-holiday weekdays) were averaged.

The final step in the evaluation analysis was assessing the proportions of project savings attributable to each measure. Lighting savings were calculated first on the basis of the difference between the lighting energy consumption of the base case and as-built models. Determining the amount of savings attributable to the HVAC and insulation measures was not quite as simple. Since both measures affect the HVAC energy consumption of the building, it was necessary to devise a method of separating the savings from each measure. To accomplish this, two more versions of the building model were run—one with only the HVAC upgrades and the other with only the insulation upgrades. Savings relative to the baseline were then calculated for each measure. Since the effect of each measure implemented independently is greater than their effect when implemented concurrently, the independent savings from each measure needed adjustment. The independent savings from each measure were used to determine *percentages* of savings attributable to the HVAC and insulation measures. The heat pumps were responsible for 97.9% of the total savings when the HVAC and insulation measures were run independently; the insulation measure was responsible for the other 2.1%. These percentages were then multiplied by the gross annual savings (less lighting savings) to estimate savings directly attributable to each measure.

7.0 Conclusions

When assessed in the aggregate, this project achieved savings at nearly the rate expected. Evaluated gross energy savings for the project were 101.6% of the tracking estimate. Energy savings slightly exceeded the tracking projection because the installed HVAC systems resulted in greater energy savings than originally estimated. This was likely the result of using slightly higher cooling and heating efficiencies in the evaluation analysis than in the tracking analysis.

The increase in evaluation HVAC savings was largely offset by the decrease in insulation savings. The insulation measure saved only 12% of the energy projected in the tracking analysis. The primary culprit

was likely the use of lower wall and roofing R-values in the tracking baseline model than those proposed in the feasibility study. As documented previously, while the feasibility study called for wall and roof R-values of 21, the modeled base case condition included R10 walls and R20 roofing, which undoubtedly led to increased building heating and cooling loads in the base case condition. By using the feasibility study specified R-values in the evaluation analysis, the savings attributable to the insulation measure were diminished considerably. Since the tracking lighting controls savings calculation method is unknown, it was not possible to assess why savings were reduced relative to the tracking projection.

Evaluated peak demand savings were only 13.0% of the tracking projection. Demand savings were reduced dramatically primarily because building HVAC and lighting systems are typically off during the 5-6 PM time frame on weekdays. Since both the fire hall and civic center are typically unoccupied during those hours, there is minimal potential for demand savings during the NSPI peak demand period.

Project ID: C-276-166-9

1.0 Facility Overview

Changes in refrigeration controls and operation were implemented in 19 convenience stores in this project. These are small individually owned and operated stores. Four of the nineteen locations were selected for site visits to confirm the installation and identify variances from tracking documents. Stores in Halifax, Dartmouth, Bedford, and Truro were selected as representative samples. All refrigeration modifications were performed on the beverage coolers. Evaporator fans, door anti-condensate heaters, and compressor/condenser fans were observed at these sites. These units cycle during all hours of the day depending on temperature and humidity and store operating hours have only a small impact on measure performance. All the observed equipment was operational and well maintained.

2.0 Summary of Savings and Adjustments

New controls were installed to control the operation of evaporator fans and door anti condensate heaters in all 19 convenience stores. Evaporator fan controls enable fan operation according to cooler temperatures. Anti condensate heaters are controlled according to humidity levels. Outside air dampers and controls that lockout the compressor and condensing fans were also installed in 10 of these locations. Outside air is used to maintain cooler temperatures replacing compressor operation. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 7.1% scale factor to account for transmission and distribution losses. There is no variance between the evaluated energy savings and tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	Customer Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Cooler controller	76,154	76,154	0	11.3	11.3	0.0
Outside air package	70,665	70,665	0	56.5	56.5	0.0
Door heater humidistat	118,086	118,086	0	15.0	15.0	0.0
Total Refrigeration Savings	264,905	264,905	0	82.7	82.7	0.0

	Generator Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Cooler controller	81,561	81,561	0	5.4	5.4	0.0
Outside air package	75,682	75,682	0	19.9	19.9	
Door heater humidistat	126,470	126,470	0	1.6	1.6	0.0
Total Refrigeration Savings	283,713	283,713	0	27.0	27.0	0.0

Project Overview

Table 2 provides a list of the refrigeration equipment by location. These fans, compressors, and door heaters operate with the beverage coolers in the stores. This table represents both the tracking and evaluation scenarios. No variations in number of units, volts, amps, or size and capacity were uncovered during the site visit.

Table 2: Summary of Controlled Refrigeration Equipment

Truro						
Equipment	Volts	Amps	Phase	# of Units	Fans or Doors/Unit	COP
Evaporators	120	3.8	1	2	2	
Compressor	240	12.4	3	1	1	2.5
Condenser Fan	120	4.7	1	1	1	
Door Heaters	120	1.96	1	3	4	

Bedford						
Equipment	Volts	Amps	Phase	# of Units	Fans or Doors/Unit	COP
Evaporators	120	2.4	1	1	3	
Compressor	240	13.4	1	1	1	2.5
Condenser Fan	240	2.2	1	1	2	
Door Heaters	120	8	1	1	4	

Dartmouth						
Equipment	Volts	Amps	Phase	# of Units	Fans or Doors/Unit	COP
Evaporators	120	6	1	2	3	
Compressor	240	30.7	1	1	1	2.5
Condenser Fan	240	3	1	1	2	
Door Heaters	120	5.53	1	1	10	

Halifax						
Equipment	Volts	Amps	Phase	# of Units	Fans or Doors/Unit	COP
Evaporators	120	6.9	1	1	3	
Compressor	240	13.4	1	1	1	2.5
Condenser Fan	240	1.1	1	1	1	
Door Heaters	120	4	1	2	2	

The key variables for this measure are the number of doors, voltage and amperage of the door heaters, number of evaporator fans, evaporator fan voltage and amperage, and the volts/amps/COP of the condensing unit package which includes the compressor and condenser fan(s).

Table 3 shows a list of the measures installed by location. Evaporator fan and door humidity controls were installed in all four locations. Free cooling using outside air in place of the compressors was installed in Truro and Dartmouth.

Table 3: Summary of Controlled Refrigeration Equipment

Installed Measures			
Location	Evaporator Fan Control	Door Heater Control	Outside Air Cooling
Truro	Y	Y	Y
Bedford	Y	Y	N
Dartmouth	Y	Y	Y
Halifax	Y	Y	N

4.0 Tracking Savings Review and Calculations

Tracking savings were generated by vendor software. Savings for the evaporator fan controls, outside air free cooling, and condensate heater controls are calculated individually and results summed estimate final savings for each site.

Evaporator fan controls:

To calculate savings the fan wattage for each evaporator is calculated from the volts, amps, and phase obtained from the nameplate data. This value is multiplied by the number of evaporator units. A fixed 55.0% reduction is set for all evaporator systems. This is multiplied by 8,760 annual hours. The fixed reduction in fan operation is 4,821 hours for all locations. The calculated evaporator power in kW is multiplied by the 4,821 hours to estimate evaporator fan savings. Additional savings are claimed for the condensing unit. There will be slightly less load at the unit with the evaporator fans off. These savings are a fixed 28.6% of the evaporator savings. Final savings is the summation of the evaporator and condensing unit savings.

Outside air controls:

The total power in kW is calculated from the nameplate data for condensing unit. This includes the compressor and condenser fan(s). The watts, amps, and phase are used in the calculations. A fixed 85% power factor is estimated for all condensing systems. This measure uses outside air to maintain cooler temperatures in place of the mechanical systems. Free cooling is estimated to be available for 140 days per year for all sites with interior condensing units. A fixed reduction in operation of 40% is applied to all free cooling measures. This shuts off the condensing unit for 1,512 hours per year. The calculated condensing unit kW is reduced by a fixed 15% load factor. This adjusted kW value is multiplied by the fixed 1,512 annual reduction in operation. New air fans are installed in the cooler to move the outside air. The power consumption of 0.17 kW is set for these fans. The 0.17 kW is multiplied by the reduction in operating hours to account for this additional fan burden. The savings are the sum of the reduced condensing unit operation and outside air system fan penalty.

Anti Condensate Heater Controls:

The data obtained from the frame tags provide the volts and amps of the anti condensate heaters. This data is used to calculate the total connected heater load. All anti condensate heaters operate 8,760 hours in the tracking savings. A fixed 90% reduction in operation is set for all units. This reduces heater operation by a fixed 7,899 hours per year. The annual savings are the calculated kW load of the door heaters times the 7,899 reduction in operation.

There are no interactive heating and cooling savings or penalties for this measure.

Peak demand savings were calculated from the connected loads for the evaporator fans, condensing units, and door heaters. The evaporator fans and door heaters ran continuously in the tracking estimates. The installed controls shut the fans and heaters off according to the temperatures inside the cooler and store humidity levels. The condensing unit cycled during the winter and is shut off for 1,512 hours during the winter. Free cooling operation is a weather variable and will shut off the condensing unit when outside air temperatures drop below the temperature in the cooler.

5.0 On-Site Methodology

The evaporators, condensing units, and door heaters were observed in each site. The nameplate data was recorded. The operating conditions of the coolers were observed. The new outside air fans were identified in the Truro and Dartmouth stores. The number of cooler doors was also noted. Cooler temperatures were read off interior thermostats. This data was compared with the same information in tracking documentation.

The store manager was interviewed about the new equipment and baseline operation. They assumed the equipment was working as promised and have had no problems with the installation. They believed that evaporator fans ran constantly before the project but were not completely sure. They had no knowledge of baseline condensate heater operation. They have seen the outside air dampers open to provide free cooling but are not sure how often they work.

6.0 On-site Observations and Findings

The nameplate data for the evaporator fans, condensing units, and door heaters all matched tracking values. The work was limited to the beverage coolers and the number of doors and size of the cooler boxes also matched the tracking data. The outside air dampers and supply fans were installed in the Truro and Dartmouth stores. Cooler temperatures were satisfied at the time of the site visit so neither the outside air supply fans or compressors were operating.

Door frames were universally cold to the touch indicating that the anti condensate heaters were not on. The evaporator fans were off in three of the four locations. The Halifax evaporator fans were operating, but there was no indication that the controller was in override or that the fans would not shut off in the future. The evaluator was not able to compare box temperatures with fan control set points to further verify fan control.

7.0 Conclusions

Annual energy savings were 100% of the tracking savings. There were no variances in the equipment types identified in the tracking documentation. Volts, amps, and phase all matched the tracking estimates. The controls were successfully controlled and appeared to be operational. Door frames were cold, most evaporator fans were off or cycling at the site visit and the provisions for free cooling are in place. There are no physical changes or difference from tracking data to calculate a savings variance.

The calculations are from a vendor work sheet that uses several fixed default operating values. The availability for free cooling, post installation door heater operation and reduction evaporator fan operation are all based upon fixed generic values. No monitoring was performed to confirm the operation of the equipment. The default values are logical and within the range of potential performance. There are no calculation changes for this project.

There are no heating or cooling interactive savings or penalties for these measures.

Peak demand savings are also 100% of the tracking estimate. Peak coincidence factors are applied to the generator savings in addition to the 1.071% loss adjustment factor. Demand savings for the evaporator fan controls are adjusted by 45%, the outside air equipment carries a 32.8% factor and a 10% factor is applied to the door heaters. The demand values are the connected loads for evaporator fans, condensing units, and door heaters. The actual operation of the installed equipment is based upon temperatures and humidity at each store. The demand estimates cannot be refined without monitoring to determine how and when operation occurs.

Project ID: C-321282-1

1.0 Facility Overview

This facility manufactures corrugated paper packaging for goods such as bottled beverages, perishable food and other retail merchandise. The building consists of manufacturing, storage, shipping, maintenance and office areas. Manufacturing processes typically run 24 hours per day and 6 days per week during their peak season of May to October. During off peak months, the manufacturing schedule drops to 8 hours a day for 5 days a week.

2.0 Summary of Savings and Adjustments

An extensive lighting retrofit was completed at this facility during the 2009 and 2010 program years. The entire building—which includes manufacturing, storage, shipping, and maintenance areas, as well as a boiler room, stock rooms, offices, washrooms and a cafeteria—was affected.

After reviewing program documentation and analysis, and verifying fixture installations during a site visit, savings were recalculated. Table 1 below presents a summary of the energy and demand savings for this project during the 2010 program year. Only 76% of the project savings were claimed for 2010 since part of the project completed in 2009. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 6.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 3.0% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	511,224	495,653	-15,572	48.0	74.2	26.2
Interactive Lighting	4,260	4,507	247	0.0	1.0	1.0
Total Savings	515,484	500,160	-15,325	48.0	75.1	27.1

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	542,409	525,887	-16,522	50.9	78.7	27.8
Interactive Lighting	4,520	4,782	262	0.0	1.0	1.0
Total Savings	546,929	530,670	-16,259	50.9	79.7	28.8

3.0 Project Overview

Table 2 below provides an overview of the fixtures installed, as well as the baseline fixtures that were removed:

Table 2: Summary of Installed and Removed Fixtures

New Fixture Type	Quantity	Preexisting Fixture Type	Quantity
ECO44T554	341	400w MH	341
ECO43T554	8	250w MH	8
8' 4L T832	28	8' 2L T-12HO	28
8' 4L T828	19	8' 2L T-12	19
8' 2L T828	12	8' 1L T-12	4
4' 4L T828	46	4' 4L T-12	46
4' 2L T832	107	4' 2L T-12	247
4' 2L T828	148	4' 1L T-12	92
4' 1L T828	72		

Note that these fixture quantities reflect slight changes to the counts made during the evaluation.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i})h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor.

Operating hours for most areas of the facility were determined from logger data. Amperage data were analyzed to determine when lights were on. The number of “on” readings recorded during the monitoring period was divided by the total number of readings to determine the percentage of weekly hours the lights typically run. This percentage was then applied to an 8,760 schedule to calculate annual run hours.

Interactive cooling savings were also claimed for space conditioned areas of the facility. Since the new fixtures operate at lower wattages, and thus impart less heat to the building, they result in cooling savings in the summer months.

The cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_h f_s}{COP} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_h = Heat gain factor (fraction of lighting energy assumed to become a load on the space)

f_s = Seasonality factor (fraction of the year assumed to require cooling)

COP = Coefficient of performance of the cooling system.

A heat gain factor of unity and a seasonality factor of .22 were used. A heating energy penalty was not assessed for this facility since all areas are heated by either natural gas or #6 furnace oil.

Peak demand savings were calculated by applying a coincidence factor of .63 to the gross change in connected load for the entire building. This factor was arrived upon by dividing an estimate of average operating hours (5,523) by 8,760. Why 5,523 hours were used is unclear. Demand savings from interactive effects were not considered.

Energy and demand savings were both adjusted to account for the fact that 24% of project savings had already been claimed during the 2009 program year. Total project energy and demand savings were multiplied by .76 to arrive at 2010 project savings.

5.0 On-Site Methodology

During the site visit, a near census of the project was completed. Of the 781 new fixtures, the installation of 753 lights was verified. The chief technologist responsible for implementing the project provided a guided walkthrough of the facility. He assisted in locating each of the lighting areas identified in the tracking savings calculation workbook.

In addition to verifying fixture installations, the accuracy of the operating hours claimed for each area of the facility in the tracking analysis was assessed with the help of the site contact. The site contact also helped identify the building areas where lighting loggers were installed.

6.0 On-site Observations and Findings

This project consisted of 39 various groups of lights characterized by fixture type and location. Of the 39 groups, slight fixture quantity discrepancies were identified in 10 instances. In many cases, these discrepancies applied to both the baseline and installed fixtures (1-for-1 replacements) and were typically on the order of only 1 or 2 fixtures. In one outlying case, 11 too few 4L T5 fixtures were identified in the central manufacturing plant and finishing area.

In two unrelated instances, the incorrect types of fixtures were installed. In the first case, 2 2L F28T8 fixtures were installed in a restroom where 2 1L F28T8 fixtures had originally been claimed. In the second case, 8 3L T5 high bay fixtures were installed in the maintenance area instead of 8 4L T5 fixtures as proposed.

The net effect of these discrepancies was that the connected load reduction of 102.6 kW claimed in the tracking savings calculation was reduced slightly to 101.9 kW. On the whole, the retrofit was completed as proposed.

Lighting logger data collected for the tracking savings analysis was also reviewed. Four amperage loggers were installed in the following locations for two weeks during February:

- Front office
- Maintenance
- Quality control
- Shipping

Three additional loggers were then installed for a three week period spanning late April until mid-May in three new locations:

- Boiler Room
- Machine Areas (Manufacturing)
- Paper Roll Storage

Amperage data were collected in 5 minute intervals and used to estimate lighting runtimes. A review of the analysis procedure revealed that correct methods were used to approximate runtimes from the logger data.

The logger data however had not been used to determine peak coincidence factors, which could have assisted in calculating peak demand savings. For the evaluation savings estimate, these data were further analyzed to determine the percentage of time lights in each monitored area were on during the 5 PM to 6 PM weekday peak period. The peak coincidence factor calculated from each logger was then applied to both the logged area and those areas most similar in operations to the logged area.

For the evaluation energy savings estimate, the fundamental calculations were left unchanged. Only the fixture counts and types were adjusted in the cases where they differed from the tracking values.

The peak demand savings calculation methodology however was changed significantly. To determine demand savings directly attributable to the lighting retrofit, the previously discussed peak coincidence

factors were applied to the connected load reduction for each lighting group. Peak demand savings for all lighting groups were then summed to calculate lighting peak demand savings.

A new method was also devised to calculate peak demand savings from interactive cooling effects. Interactive cooling demand savings were calculated as,

$$D_{S-inter} = \left(\frac{\Delta kW_L f_{h-c} f_{s-c}}{COP} \right) CF \quad (3)$$

where,

$D_{S-inter}$ = Interactive effects demand savings [kW]

ΔkW_L = Connected load reduction

f_{h-c} = Cooling season heat gain factor

f_{s-c} = Cooling season seasonality factor

COP = Cooling system coefficient of performance

CF = Peak demand period coincidence factor

In the above equation, the seasonality factor scales the demand savings to only account for the cooling season. The coincidence factor accounts for the fact that lights may not continuously operate during the peak demand period. This equation was applied to each lighting group in areas with space cooling. Savings from all areas were summed to calculate interactive effects peak demand savings.

As in the tracking analysis, project energy and demand savings were scaled by a factor of .76 to account for the fact that 24% of project savings had been claimed for the 2009 program year.

7.0 Conclusions

Annual energy savings were 97% of tracking savings. However, the savings in the tracking system were not properly updated with the results of the DSM Administrator's M&V work (discussed in Section 4). Instead, the values in the tracking system reflect the savings calculated for the Project Development Agreement (PDA). These savings were calculated using the same spreadsheet approach, but they do not reflect updates to operating hours made during the M&V process. Nonetheless, if tracking savings estimates had been updated with the results of NSPI's M&V analysis, the realization rate would have only increased slightly to 99.3%.

Relative to the M&V savings results, shifts in fixture quantities and types were limited to such a small portion of the lights that they had a minimal effect on the overall savings. Furthermore, since the lighting logger data were properly used to estimate facility hours, no adjustments were necessary to the annual operating hours.

Peak demand savings were 156.5% of the tracking estimate. Again, this tracking value was based on the PDA savings as opposed to the M&V savings because NSPI did not update their tracking system. If the M&V demand savings estimate had been input into the tracking system, the realization rate would have only dropped to 152.9%. In either case, the evaluated demand savings exceeded tracking demand savings primarily because the peak coincidence factor used in the tracking savings calculation (.63) was considerably lower than the load weighted average coincidence factor used in the evaluation analysis

(.96). Evaluated peak demand savings were also slightly increased by the inclusion of interactive effects demand savings, which had not been accounted for in either the PDA or M&V analyses.

In general, there were few issues with the project implementation and energy savings calculations. The only major issues were the overly simplified methodology used to assess peak demand savings and the lack of updated M&V savings values in the tracking database.

Project ID: C-335672-1

1.0 Facility Overview

This facility is a college campus. The college is composed of 18 abutting buildings that have been modified to make one contiguous campus. Classrooms, studios, workshops, galleries, a library, cafeteria and offices comprise the majority of the building space. Unlike most universities, this college remains open 24 hours per day and 7 days per week to allow students to work on projects at all hours. The university only closes for one week between Christmas and New Years, otherwise it operates year round.

2.0 Summary of Savings and Adjustments

A thorough lighting retrofit of the entire campus was completed. Offices, hallways, classrooms, studios, workshops, the cafeteria, libraries, computer labs and restrooms were all affected. With the exception of a few specialty purpose lights and lights that were already retrofitted, the entire college was updated with new lights. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 7.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 0.7% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	Customer Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	384,461	381,972	-2,489	64.4	60.6	-3.8
Interactive Lighting	14,174	13,720	-454	0.0	2.1	2.1
Total Savings	398,635	395,693	-2,943	64.4	62.7	-1.7

	Generator Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	411,758	409,092	-2,665	69.0	64.9	-4.1
Interactive Lighting	15,180	14,694	-486	0.0	2.3	2.3
Total Savings	426,938	423,787	-3,151	69.0	67.1	-1.9

3.0 Project Overview

New fixtures installed as part of this retrofit included,

- 24 1L T8 fixtures
- 259 2L T8 fixtures
- 26 4L T8 fixtures
- 15 9W CFLs
- 415 14W CFLs
- 42 15W CFLs

- 151 23W CFLs
- 4 2x14W CFLs
- 14 2.4W LED Fixtures

Note that these fixture quantities reflect slight changes to the counts made during the evaluation.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each group, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i})h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

Operating hours for most areas of the campus were provided by the site contact. Two lighting loggers were also installed to verify operating hours in select areas. These loggers were installed in a weaving classroom and a computer lab.

Interactive heating and cooling savings were also claimed for the lighting project. Since the new fixtures operate at lower wattages, and thus impart less heat to the buildings, they result in negative heating savings in the winter months, and positive cooling savings in the summer months.

The heating penalty and cooling bonus were calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_{h-c} f_{s-c}}{COP} - \frac{E_{S-L} f_{h-h} f_{s-h}}{\eta} \quad (2)$$

where,

$E_{S-inter}$	= Interactive Effects Savings [kWh]
E_{S-L}	= Direct lighting savings [kWh]
f_{h-c}	= Cooling season heat gain factor
f_{s-c}	= Cooling season seasonality factor
f_{h-h}	= Heating season heat gain factor
f_{s-h}	= Heating season seasonality factor
COP	= Cooling system coefficient of performance
η	= Heating system efficiency

In Equation 2, heat gain factors designate the portion of lighting energy that ultimately becomes a heat load on the building. For the heating penalty, a heat gain factor of .156 was assumed. For the cooling bonus, a heat gain factor of 1 was used. It's not clear why such a large discrepancy between the heating and cooling heat gain factors exists. Nonetheless, NSPI uses this approach in all of their lighting savings calculations, so was left unchanged for the sake of consistency.

The seasonality factors in Equation 2 account for the fact that heating and cooling are only required for portions of the year, and thus the additional lighting heat load may not necessarily result in additional HVAC equipment operation. Seasonality factors of .5 and .22 were used for the heating and cooling calculations respectively.

In portions of the campus heated by natural gas and #2 furnace oil, no heating penalty was assessed; a heating penalty was only assessed for those areas served by electric resistance heating.

Peak demand savings were calculated by applying a coincidence factor of .9 to the gross change in connected load for the entire campus. Demand savings from interactive effects were not considered.

5.0 On-Site Methodology

Since this project consisted of over 1,300 fixtures, a sampling approach was taken to verify that lights were properly installed. The electrician responsible for installing the fixtures was available on-site to assist in identifying the affected areas of the campus.

Using the savings calculation spreadsheet developed for the tracking savings estimate, areas of the campus with the greatest savings were selected for verification. Other areas with lesser savings were also randomly selected to ensure that not only the large rooms had been addressed. In all, 623 fixtures out of a possible 1,368 fixtures were counted. The sampled fixtures were accountable for 56% of the claimed tracking savings.

6.0 On-site Observations and Findings

In the majority of sampled rooms, the quantity of installed fixtures matched the quantity listed in the tracking savings spreadsheet. Of the 35 sampled lighting groups, verified fixture counts exceeded tracking fixture counts in 12 cases. Generally, the counts were only off by 1 to 3 fixtures. In all 12 cases savings had been understated because the fixtures were retrofitted on a 1-for-1 basis.

In one area, the retrofits were found to be incomplete. According to the site contact, the gallery was retrofitted with 31 CFLs as proposed, but then returned to the original state at the request of students who thought the new lights produced less than ideal lighting conditions for their needs.

Aside from these discrepancies, the fixtures were generally found installed as proposed. Because the identified issues did not appear systemic, adjustments made to the surveyed sample were not extrapolated to the population in the evaluation analysis.

The lighting logger data collected for the tracking savings analysis was also reviewed. One logger had been installed in the weaving classroom; the second logger was installed in a computer lab. Both loggers were set to record amperage data in 5 minute intervals. These data were then used to estimate lighting runtimes in those areas. Runtime estimates from these two loggers were also applied to other areas which had previously been assigned equivalent schedules in the savings spreadsheet. Data from both lighting loggers were appropriately used to adjust the savings estimate.

For the evaluation energy savings estimate, the fundamental calculations were left unchanged. Only the fixture counts in the sampled areas were adjusted to reflect actual site conditions.

The peak demand savings calculation method was altered to account for interactive effects. However, for direct lighting demand savings, the calculation was unchanged since insufficient logger data were collected to warrant an adjustment. If loggers had been installed in a large sample of areas, the resulting data could have been used to adjust the peak demand coincidence factor. Since loggers were only installed in two areas, peak demand savings were taken as the change in connected load multiplied by a peak coincidence factor of .9. Given that many areas of the college operates 24 hours per day, and classes during the 5 to 6 PM weekday time frame are not uncommon at a typical college, the high coincidence factor used in the tracking analysis seemed reasonable.

Interactive effects demand savings were calculated as,

$$D_{S-inter} = \left(\frac{\Delta kW_L f_{h-c} f_{s-c}}{COP} - \frac{\Delta kW_L f_{h-h} f_{s-h}}{\eta} \right) CF \quad (3)$$

where,

$D_{S-inter}$	= Interactive effects demand savings [kW]
ΔkW_L	= Connected load reduction
f_{h-c}	= Cooling season heat gain factor
f_{s-c}	= Cooling season seasonality factor
f_{h-h}	= Heating season heat gain factor
f_{s-h}	= Heating season seasonality factor
COP	= Cooling system coefficient of performance
η	= Heating system efficiency
CF	= Peak demand period coincidence factor

In the above equation, seasonality factors account for the respective portions of the year that demand savings result from cooling and a demand penalty occurs for heating. The coincidence factor accounts for the fact that lights may not necessarily be operating during the peak demand period.

7.0 Conclusions

Annual energy savings were 99.3% of the tracking savings. For the most part, the reduction in energy savings caused by the unimplemented art gallery retrofit was offset by increased savings in rooms where more lights were retrofit than originally claimed.

Peak demand savings were 97.3% of the tracking estimate. However, the peak demand savings claimed in the tracking database were incorrectly specified. The generator savings supplied in the tracking database (referenced in Table 1 above) were actually the demand savings *at the site* before applying a peak coincidence factor or a transmission loss factor adjustment. It was simply happenstance that the evaluated peak demand savings so closely matched the tracking peak demand savings.

If the tracking value had been properly updated with the results of the DSM Administrator's M&V analysis, the demand savings realization rate would have increased to 101.4%. Evaluated demand savings were slightly greater than the actual M&V result because interactive effects demand savings were not accounted for in the M&V calculation. Considering the comprehensiveness of this project, the issues with implementation were relatively minor. The only major issue was improper data entry in the tracking database.

Project ID: C-348218-2

1.0 Facility Overview

This lighting project was installed across eight different buildings in three locations. These were air maintenance facilities and machine shops. These structures have high bay work areas, tool and maintenance areas, shops, and offices. Most areas have high levels of activity. Work bays and assembly areas operate 7,000 hours to 8,760 hours per year. Support and maintenance operation ranges from 4,000 to 6,000 hours per year. Offices operate from 2,600 to 4,800 annual hours depending upon location. Most heating is provided by boilers firing #2 oil. Electric resistance baseboards provide heating for some offices and small work spaces. Direct expansion cooling equipment provides space cooling.

2.0 Summary of Savings and Adjustments

An extensive lighting retrofit was completed in the facility. Lighting systems in high bay hangers, assembly areas, maintenance areas, and offices were replaced. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 6.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 19.6% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

<i>Customer Savings</i>						
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	2,414,534	1,947,849	-466,685	381.0	348.8	-32.2
Interactive Lighting	7,688	616	-7,072	0.0	0.0	0.0
Total Savings	2,422,222	1,948,465	-473,757	381.0	348.8	-32.2

<i>Generator Savings</i>						
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	2,551,994	2,066,668	-485,326	329.9	302.1	-27.9
Interactive Lighting	8,126	654	-7,472	0.0	0.0	0.0
Total Savings	2,560,120	2,067,322	-492,798	329.9	302.1	-27.9

3.0 Project Overview

Table 2 and Table 3 below provide overviews of the installed and removed fixtures respectively:

Table 2: Summary of Installed Fixtures

Location	Fixture Type	Quantity	Fxt. Wattage
Area 1	3L T-5HO	0	176
Area 1	FB 6L T5HO	68	351
Area 1	4L 4' T-8	7	90
Area 1	2L 4' T-8	19	42
Area 1	3L T-5HO	0	176
Area 2	1L 4' T-8	14	23
Area 2	2L 4' T-8	82	42
Area 2	2L U T-8	56	42
Area 2	4L 4' T-8	188	76
Area 2	4L 8' T-8	134	90
Area 2	FB 8L T-5HO	84	468
Area 3	2L 4' T-8	33	42
Area 3	4L 4' T-8	162	90
Area 3	FB 4L T-5HO	27	234
Area 4	1L 4' T-8	3	23
Area 4	2L 4' T-8	101	42
Area 4	2L U T-8	47	42
Area 4	4L 4' T-8	96	76
Area 4	4L 8' T-8	32	90
Area 4	FB 4L T-5HO	80	234
Area 5	1L 4' T-8	71	23
Area 5	2L 4' T-8	902	42
Area 5	4L 8' T-8	188	90
Area 5	FB 6L T5HO	83	351
Area 6	FB 6L T-5HO	61	351
Area 7	1L 4' T-8	6	23
Area 7	2L 4' T-8	77	42
Area 7	2L T-8 HBF	60	76
Area 7	4L 8' T-8	482	90
Total		3,163	98.9 Avg/ Fxt

Table 3: Summary of Removed Fixtures

Location	Fixture Type	Quantity	Fixt. Wattage
Area 1	175W Wall Pks	0	205
Area 1	250W HPS	0	290
Area 1	2L 4' T-12	19	80
Area 1	2L 8' T-12	7	137
Area 1	400W HPS	68	450
Area 2	1000W MH	49	1,075
Area 2	1L 4' T-12	14	50
Area 2	2L 4' T-12	82	80
Area 2	2L 8' T-12	110	137
Area 2	2L U T-12	56	96
Area 2	4L 4' T-12	188	160
Area 2	4L 8' T-12	24	346
Area 3	2L 4' T-12	36	80
Area 3	2L 8' T-12	171	137
Area 3	400W MH	27	450
Area 3	4L 4' T-12	14	160
Area 4	1L 4' T-12	3	50
Area 4	2L 4' T-12	101	80
Area 4	2L 8' T-12	32	137
Area 4	2L U T-12	47	96
Area 4	400W MH	80	450
Area 4	4L 4' T-12	96	160
Area 5	1000W MH	77	1,075
Area 5	175W Wall Pks	44	205
Area 5	1L 4' T-12	71	50
Area 5	2L 4' T-12	902	80
Area 5	2L 8' T-12	12	137
Area 5	400W MH	6	450
Area 5	4L 4' T-12	132	160
Area 6	400W MH	450	61
Area 7	1L 4' T-12	6	50
Area 7	2L 4' T-12	77	80
Area 7	2L 8' T-12	482	137
Area 7	4L 4' T-12	60	160
Total		3,543	159.1 Avg/Fixt

Fixture types and wattages for the pre-existing fixtures were taken at face value since preexisting fixtures were unavailable for verification at the time of the evaluation-site visit. The quantities of fixtures in the tables reflect inventories found at the site. The lighting replacements at the remote maintenance location are included in the tracking savings. That site was not scheduled for a site visit and those fixtures are not

included in the lighting summary. Site personnel could not confirm the installation matches tracking estimates at that site. Fixture tables do not include data from this site.

Table 4 provides a breakout of the installed project by lighting technology. New T8 lamps and ballasts makeup 87.3% of the fixtures installed. The T5 equipment accounts for 12.7% of the installation. Original baseline high-bay metal halide fixtures and some fluorescent fixtures remain in the facilities. This equipment is not included in the fixture counts.

Table 4: Summary of Installed Fixtures by Type

Fixture Type	Fxt. Wattage	Quantity
2L 4' T-8	42	1214
4L 8' T-8	90	836
4L 4' T-8	76	284
4L 4' T-8	90	169
FB 6L T5HO	351	151
FB 4L T-5HO	234	107
2L U T-8	42	103
1L 4' T-8	23	94
FB 8L T-5HO	468	84
FB 6L T-5HO	351	61
2L T-8 HBF	76	60

Fixture Type	Quantity	Percent
Total T-8	2,760	87.3%
Total T-5	403	12.7%
Totals	3,163	100.0%

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i})h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

Logger information and trend logs were provided in the tracking documentation. Logger data was provided for an assembly area and an office building. Pivot tables were made of the logger data and compared with tracking hours and with operation schedules provided by site personnel. The loggers showed usage of 3,502 hours in assembly and 3,209 hours in the office. The site contact felt these were high, especially the monitored Saturday usage.¹³ Operation was reduced to 2,500 hours accordingly. Loggers also monitored operation of lighting in the offices and work areas in hangers 1, 2, 3, and 6. The logger data confirmed the continuous operation [8,760 hours] in hanger 2. A logger confirmed the 7,100 annual hours of operation in hanger 1 and 4,800 hours in an office in hanger 3. The data from the other loggers was not as clear. The loggers are generically labeled and it is not easy to match trend data to a specific fixture type or specific location. Readings from a single logger may provide an anomalous reading and not be typical of average operation. A logger monitoring an office in hanger 2 showed 8,760 hours of operation. Lighting operation for each location and space type were reviewed with site personnel and the confirmed operating hours were used in the calculations.

Interactive cooling savings were also claimed for space conditioned and refrigerated areas of the facility. The new fixtures operate at lower wattages. This results in less waste heat generated by the lighting systems. This reduction in waste heat slightly increases heating costs. Air conditioning loads are reduced resulting in lower cooling costs. The new lighting systems provide additional refrigeration savings for the entire year.

The cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_h f_s}{COP} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_h = Heat gain factor (fraction of lighting energy assumed to become a load on the space)

¹³ While logger data is generally reliable, circumstances sometimes necessitate adjusting results when fixtures selected are not representative of general lighting operations. Schedules are routinely reviewed with site personnel to confirm accuracy. In this case, the weekend usage was not typical for the area monitored.

f_s = Seasonality factor (fraction of the year assumed to require cooling)

COP = Coefficient of performance of the cooling system

A 3.0 COP was assigned to cooling equipment at serving office spaces. The cooling season was estimated at 22% of the annual lighting operating hours.

Electric heating energy penalties were calculated electric resistance heating. Heating systems have to make up the difference in waste heat resulting in higher heating operation. Heating operations were estimated at 100% of the year.

Peak demand savings were calculated by applying system peak coincidence factors to individual lighting loads defined by location and operation. These adjustment factors ranged from 28.68% in a remote maintenance facility to 100.0% in main high-bay work areas. Demand savings from interactive effects were not considered.

5.0 On-Site Methodology

The installation of the new lighting equipment was discussed with site personnel. The areas identified in the tracking files were reviewed along with the baseline equipment and operation. The site contact agreed with the baseline assumptions. The stated lighting hours were in line with the operation in his facility. Heating and cooling equipment was discussed and observed in the field. One facility was not part of the scheduled site visits. The lighting installation there was discussed with site personnel, but the condition of the final project could not be confirmed. The calculations were reviewed for consistency and accuracy, but no changes were made to equipment type, quantity, or operation.

A detailed walk through was performed. The fixture types and quantities in the field were matched to the corresponding inventories from the tracking documents. There was some difficulty in exactly matching fixture quantities in the tracking spreadsheets to the site counts. These are large open areas and the boundaries that separate sections are not often clear. The total fixture count taken on-site match closely with the tracking estimates. A complete lighting inventory was performed of all fixtures according to general usage along with the fixture type. Annual lighting operation was also obtained for each location. The savings re-creation spreadsheet was populated from the collected data.

6.0 On-site Observations and Findings

Variations in fixture quantities and installed technologies account for the reduction in annual savings. Thirty-two 6-lamp fixtures could not be located in the one work area as well as the 10 wall pack fixtures. However 30 additional 8-lamp T5 fixtures were counted in hanger 1. Tracking data showed sixty-five 4-lamp T5 fixtures were to be installed in a high-bay area. The site inventory found that sixty-eight 6-lamp T5 fixtures were installed. This added 2.64 kW to the installed lighting load. Fewer T8 fixtures were installed in a maintenance facility and two high-bay work areas.. Five additional T8 fixtures were inventoried in another high-bay work area. In total, 89 fewer fixtures were inventoried than listed in tracking documentation. Some of the variation may be due to access and space identification. Generic labeling office and work area make locating the same areas difficult. Some variances may also be terminology based. Conversions of 8' T12 systems can pose post retrofit identification problems. Annual operating hours were reduced by 50% for 52 fixtures in hangers 3 and 6. These fixtures are located in

support/service areas. They are not included in the high-bay work area circuits and do not operate 8760 hour per year.

Interactive heating and cooling effects are minimal for this project. Most of the facility consists of open high-bay work areas and assembly stations and are not air conditioned. Offices in one facility are heated with electric resistance. Direct expansion air conditioning is used in office spaces. Cooling efficiencies were confirmed in the field as needed.

7.0 Conclusions

Annual energy savings were 80.4% of the tracking savings. Changes in the fixture counts and type reduced total savings by 466,685 kWh. The change in technology for over 60 fixtures from 4-lamp T5 to 6-lamp T5 decreased annual savings. The remainder of the shortfall is linked with the reduction in T8 fixture counts. Reductions in annual operation at the maintenance facility also lowered annual savings.

Interactive savings play a minimal role in total savings. Interactive savings are 7,072 kWh less than tracking estimates. This variance is due to reduced fixture quantities in air-conditioned spaces.

Peak demand savings were 91.6% of the tracking estimate. This variance reflects the reduction in fixture counts and changes in equipment type.

Project ID: C-450311-1

1.0 Facility Overview

This facility is a multistory office building in downtown Halifax. The building comprises 230,000 square feet of leasable space spanning 15 floors. Most offices operate on typical 8 AM to 6 PM weekday schedules with occasional weekend occupancy.

2.0 Summary of Savings and Adjustments

This project consisted of a thorough lighting retrofit of the entire building. Tenant spaces, hallways, lobbies, washrooms, and mechanical rooms were all retrofitted. The majority of the project involved replacing 2 and 4 foot T12 fixtures throughout tenant spaces with low wattage T8 fixtures. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 7.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately .3% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	647,558	644,065	-3,493	149.8	149.1	-0.6
Interactive Lighting	-3,022	-3,006	16	0	-0.7	-0.7
Total Savings	644,536	641,059	-3,477	149.8	148.5	-1.3

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	693,534	689,793	-3,741	160.4	159.7	-0.7
Interactive Lighting	-3,236	-3,219	17	0.0	-0.7	-0.7
Total Savings	690,298	686,574	-3,724	160.4	159.0	-1.4

3.0 Project Overview

Table 2 below provides a summary of the new fixtures installed as part of this project and the fixtures they replaced.

Table 2: Summary of New and Pre-existing Fixtures

New Fixture Type	Quantity	Preexisting Fixture Type	Quantity
14W CFL	70	100a Table Lamp (?)	1
16W CFL	82	60a Keyless (?)	2
23W CFL	1	50W Par20	13
		75W Par30 (or 38)	137
1L F17	2	1L 2' T12	2
2L F17 T8	1,195	2L 2' T12	1,195
1L F28 T8	275	1L 4' T12	275
2L F28 T8	1,010	2L 4' T12	175
		3L 4' T12	835
LED Exit	2	Incand. Exit	2
Total	2,637		2,637

Note that these fixture quantities reflect slight changes to the counts made during the evaluation. Question marks next to fixture types indicate cases where the meanings of the pre-existing fixture type names in the tracking spreadsheet were not entirely clear.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i})h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

The operating hours used in Equation 1 for the washrooms, mechanical rooms, and the two floors used by the building owners were based on data collected from site contacts. In the remainder of the building—which includes all of the tenant spaces, halls, and the main lobby—operating hours were estimated based on amperage data collected with four data loggers.

Interactive heating and cooling savings were also claimed for this project. Since the new fixtures operate at lower wattages, and thus impart less heat to the buildings, they result in negative heating savings in the winter months, and positive cooling savings in the summer months.

The net effect of the heating penalty and the cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_{h-c} f_{s-c}}{COP} - \frac{E_{S-L} f_{h-h} f_{s-h}}{\eta} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_{h-c} = Cooling season heat gain factor

f_{s-c} = Cooling season seasonality factor

f_{h-h} = Heating season heat gain factor

f_{s-h} = Heating season seasonality factor

COP = Cooling system coefficient of performance

η = Heating system efficiency

In Equation 2, heat gain factors designate the portion of lighting energy that ultimately becomes a heat load on the building. For the heating penalty, a heat gain factor of .156 was assumed. For the cooling bonus, a heat gain factor of 1 was used. It is not clear why such a large discrepancy between the heating and cooling heat gain factors exists. Nonetheless, NSPI uses this approach in all of their lighting savings calculations, so it was left unchanged in the evaluation calculation for the sake of consistency.

The seasonality factors in Equation 2 account for the fact that heating and cooling are only required for portions of the year, and thus the additional lighting heat load may not necessarily result in additional HVAC equipment operation. Seasonality factors of .5 and .22 were used for the heating and cooling calculations respectively.

Lighting peak demand savings were calculated by applying a coincidence factor of .9 to the gross change in connected load for the building. Demand savings from interactive effects were not considered.

5.0 On-Site Methodology

Since this project consisted of over 2,600 fixtures, a sampling approach was taken to verify that lights were properly installed. Of the buildings 14 office floors (2 through 15), floors 9, 12, 14, and 15 were surveyed. These floors were chosen at random. Floors 9 and 12 house separate tenants and floors 14 and 15 are occupied by the building ownership group. Lobbies and select washrooms on the 3rd and 6th floors were also surveyed to check consistency between floors. In total, 373 fixtures were surveyed.

In addition to surveying the floors, the primary site contacts (building maintenance staff) were asked to estimate the typical operating schedules for most building tenants. This scheduling information was then used to confirm the applicability of the logger data to tenant spaces.

6.0 On-site Observations and Findings

On each of the sampled floors, there were slight discrepancies between the verified installations and the fixture quantities claimed in the tracking data. In general, these discrepancies were on the order of 1 or 2 lights. Table 3 below provides a comparison of the evaluation and tracking counts in each of the surveyed areas.

Table 3: Comparison of Surveyed and Tracking Data Fixture Counts

Floor	Fixture Type	Tracking Count	Evaluation Count	Discrepancy
Floors 14 & 15 (Offices)	2L F17 T8	124	125	1
	2L F28 T8	2	2	0
Floor 12 (Offices)	2L F17 T8	89	83	-6
	2L F28 T8	21	21	0
Floor 9 (Offices)	2L F17 T8	52	51	-1
	2L F28 T8	40	38	-2
Floor 9 (Lobby)	2L F17 T8	2	2	0
	1L F28 T8	12	12	0
Floor 6 (Lobby)	2L F17 T8	2	2	0
	1L F28 T8	12	12	0
Floor 6 (Men's WR)	2L F28 T8	4	4	0
Floor 3 (Lobby)	2L F17 T8	5	5	0
	1L F28 T8	12	12	0
Floor 3 (Men's WR)	2L F28 T8	4	4	0

Since all retrofits were performed on a 1-for-1 basis, the slightly lower evaluation counts reflect a reduction in savings. However, since the discrepancies were relatively minor, it was deemed unnecessary to survey additional floors. Because the identified issues did not appear systemic, adjustments made to the surveyed sample were not extrapolated to the population in the evaluation analysis.

The lighting logger data collected for the tracking savings analysis were also reviewed. One logger was installed on emergency fixtures. Three additional loggers were installed on fixtures in tenant office spaces. All loggers were set to record amperage data in 5 minute intervals. The emergency fixture data, when extrapolated to an annual schedule, indicated that the emergency lights operate 7,700 hours annually. Data from the three tenant loggers were averaged to estimate an annual office lighting schedule of 3,201 hours. 3,201 hours equates a reasonable office schedule of roughly 61 hours per week.

For the evaluation energy savings estimate, the fundamental calculations were left unchanged. Only the fixture counts in the sampled areas were adjusted to reflect verified quantities.

The peak demand savings calculation was altered in a couple of ways. Instead of using a generic peak coincidence factor of .9, the logger data were used to estimate the percentage of lights on during the 5 PM to 6 PM weekday peak period. Coincidence factors of .533 and .933 were calculated for the emergency lights and office lights respectively. The office coincidence factor was also applied to all remaining lights in the building since their operating patterns are more likely to follow the office schedules than the emergency schedule.

In addition to updating coincidence factors, a method was introduced to calculate demand savings from interactive effects with building HVAC systems. Interactive effects demand savings were calculated as,

$$D_{S-inter} = \left(\frac{\Delta kW_L f_{h-c} f_{s-c}}{COP} - \frac{\Delta kW_L f_{h-h} f_{s-h}}{\eta} \right) CF \quad (3)$$

where,

$D_{S-inter}$ = Interactive effects demand savings [kW]

ΔkW_L = Connected load reduction

f_{h-c} = Cooling season heat gain factor

f_{s-c} = Cooling season seasonality factor

f_{h-h} = Heating season heat gain factor

f_{s-h} = Heating season seasonality factor

COP = Cooling system coefficient of performance

η = Heating system efficiency

CF = Peak demand period coincidence factor

In the above equation, heat gain factors and seasonality factors hold the same meaning they did in Equation 2. The coincidence factor accounts for the fact that lights may not necessarily be operating during the peak demand period. Equation 3 was applied to all retrofitted areas of the building served by HVAC systems (100% in this case). Savings from all areas were summed to arrive at interactive effects peak demand savings.

7.0 Conclusions

Annual energy savings were 99.5% of the tracking savings. Peak demand savings were 99.1% of the tracking estimate. The slight reduction in energy savings was the result of fewer fixtures being retrofitted in the sampled areas than stated in the tracking savings calculation. Demand savings were also reduced slightly because of the fixture quantity reduction. Interactive effects peak demand savings—which had not been addressed in the tracking calculation—also negatively affected the demand savings estimate because the negative effects of the heating penalty outweighed the positive effects of the cooling bonus. Overall, no major issues were identified during the evaluation process that significantly affected the project savings estimates.

Project ID: C-490254-1

1.0 Facility Overview

This is a dairy plant that produces ice cream and other frozen/refrigerated food products. The main areas of the facility include production lines, packaging, frozen storage, shipping, labs, and office spaces. Production areas operate 24-hours a day Monday through Saturday, and then from 6 am to 6 pm on Sunday. Cold storage and shipping areas operate 24-hours per day, 7-days per week. Office areas follow a more weekday schedule of roughly 8 am to 5 pm. Heating is provided by #2 oil. Direct expansion cooling equipment provides space cooling. Ammonia chillers are used for refrigeration at the site.

2.0 Summary of Savings and Adjustments

An extensive lighting retrofit was completed in the facility. Lighting systems in production areas, freezers, shipping, dry storage areas, receiving, and mechanical equipment spaces were replaced. Additional modifications were made in office and lunch room lighting. Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 6.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 13.6% greater than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	323,369	327,672	4,303	50.8	42.0	-8.8
Interactive Lighting	49,531	96,113	46,583	0.0	11.4	11.4
Total Savings	372,900	423,785	50,885	50.8	53.4	2.6

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	343,095	347,660	4,565	53.9	44.5	-9.4
Interactive Lighting	52,552	101,976	49,424	0.0	12.1	12.1
Total Savings	395,647	449,636	53,989	53.9	56.6	2.7

3.0 Project Overview

Table 2 and Table 3 below provide overviews of the installed and removed fixtures respectively:

Table 2: Summary of Installed Fixtures

Fixture Type	Quantity	Fixt. Wattage
4' 2L T8 Elec. Ball	56	20
4' 4L T8 Elec. Ball	112	59
8' 2L T8 Elec. Ball	112	21
4' 6L T8	154	11
6L T5	200	245

Table 3: Summary of Removed Fixtures

Fixture Type	Quantity	Fixt. Wattage
4' 2L mag. Ball	20	88
4' 4L mag. Ball	60	156
8' 2L mag. Ball	21	170
HPS	14	225
HPS	35	360
MH	10	225
MH	8	250
MH	189	360

Fixture types and wattages for the pre-existing fixtures were taken at face value since preexisting fixtures were unavailable for verification at the time of the evaluation-site visit. The quantities of fixtures in the tables reflect inventories found at the site.

The high intensity discharge lighting [HPS & MH] were located in the high-bay production areas, shipping and receiving docks, mechanical spaces, and freezers. These fixtures were replaced with the new 6-lamp T5 and 6-lamp T8 equipment. These new units provide quicker re-strike in these large areas as well as energy savings. The remaining T8 equipment was installed in the offices, lunch room, and mechanical spaces.

4.0 Tracking Savings Review and Calculations

Tracking savings were calculated using a spreadsheet based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each grouping, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group's location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i}) h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

No loggers were installed to monitor operating hours. The project has only been recently completed and that measurement process has yet to be implemented. The annual operating hours listed in the spreadsheet were reviewed and discussed with facility personnel. These values were considered appropriate and retained for the evaluation.

Interactive cooling savings were also claimed for space conditioned and refrigerated areas of the facility. The new fixtures operate at lower wattages. This results in less waste heat generated by the lighting systems. This reduction in waste heat slightly increases heating costs. Air conditioning loads are reduced resulting in lower cooling costs. The new lighting systems provide additional refrigeration savings for the entire year.

The cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_h f_s}{COP} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_h = Heat gain factor (fraction of lighting energy assumed to become a load on the space)

f_s = Seasonality factor (fraction of the year assumed to require cooling)

COP = Coefficient of performance of the cooling system

A 3.0 COP was assigned to cooling and refrigeration equipment. The cooling season was estimated at 22% of the annual lighting operating hours. Interactive refrigeration savings was applied to 100% of the annual lighting operation. An electric heating penalty was not assessed for this facility as it is heated by #2 fuel oil.

Peak demand savings were calculated by applying system peak coincidence factors to individual lighting loads defined by location and operation. These adjustment factors ranged from 29.8% in offices to 90.5% in the production areas. The average system peak adjustment factor is 69.5%. Demand savings from interactive effects added 11.4 kW to customer demand savings and 12.1 kW to generator demand savings.

5.0 On-Site Methodology

The installation of the new lighting equipment was discussed with site personnel. There were no outstanding issues and the installed lighting is working well. Light levels have increased in several areas improving the working environment. The areas identified in the tracking files were reviewed along with the baseline equipment and operation. The site contact agreed with the baseline assumptions. The stated lighting hours were in line with the operation in his facility. Heating, cooling, and refrigeration equipment was discussed and observed in the field.

A detailed walk through was performed. The fixture types and quantities in the field were matched to the corresponding inventories from the tracking documents. It was often difficult to precisely match fixture counts with documented data by area. This is primarily due to the open nature of production areas and differing labeling designations. There are no clear boundaries that define a production area or a palletizing area. There are numerous mechanical spaces and the exact space is not clearly identified in the tracking documents. A complete lighting inventory was performed of all fixtures according to general usage along with the fixture type. Annual lighting operation was also obtained for each location. The savings re-creation spreadsheet was populated from the collected data.

6.0 On-site Observations and Findings

Tracking savings are based upon the installation of 334 fixtures. The site evaluation identified 22 additional fixtures bringing the installed count to 356. The variance can be attributed to the identification of fixtures by location as described earlier. The lamp/ballast configurations also play a role in fixture identification. Tracking data refers to 8' 2-lamp fixtures in the baseline. If that fixture is rebuilt with on ballast and two 4' T8 lamps, then that is one two lamp fixture. The same 8' strip can be equipped with four 4' lamps and either one or two ballasts. This could be counted as two new 2-lamp fixtures or one new 4-lamp fixture. The increased fixture count increased load by only 4.3 kW.

Table 4: Comparison of Evaluation and Tracking Installed Fixtures

Evaluation		Tracking	
Type	Fixture Quantity	Type	Fixture Quantity
4' 2L T8 Elec. Ball	20	4' 2L T8 Elec. Ball	20
4' 4L T8 Elec. Ball	59	4' 4L T8 Elec. Ball	59
8' 2L T8 Elec. Ball	21	8' 2L T8 Elec. Ball	5
4' 6L T8	11	6L T5	250
6L T5	245	Total	334
Total	356	Difference	22

There was also a small variation in equipment type installed. Six-lamp T8 fixtures were observed in production and dry storage areas. These fixtures did not exist prior to the project. Tracking documents show two Wattage values for 6-lamp T5 fixtures [200-Watts and 125-Watts]. The 125-Watt fixtures may have been labeled incorrectly. However, documentation lists these fixtures in the ingredients and dock

areas. The site evaluation found the fixtures in the dock and production spaces. This may simply be another labeling issue.

The cooling and refrigeration equipment was also reviewed for interactive savings. Tracking calculations make no differentiation between air-conditioned and refrigerated spaces. Interactive space cooling savings are calculated using a COP of 3.0. The site has a large ammonia refrigeration plant and extensive low temperature loads. Loads in freezers are continuous and year round. A 1.56 COP was assigned to low temperature freezers and a 1.72 COP for all other refrigeration.

7.0 Conclusions

Annual energy savings were 113.6% of the tracking savings. The addition of 22 fixtures and variance in the counts of 6-lamp T8 and 6-lamp T5 units added 4,303 kWh to the annual savings. There were no changes in operating hours for any of the systems.

Changing the COPs to 1.56 for low temperature systems and 1.72 for all other refrigeration loads provides a more accurate assessment of the interactive effects when compared with treating the loads as space cooling. The interactive cooling savings of 96,113 kWh is 46,583 kWh greater than the tracking estimates.

Peak demand savings were 5.1% greater than the tracking estimate. The tracking savings originally included an additional 67 fixtures that were double-counted in the site. The 53.9 kW demand value still reflects the original tracking estimates with the additional fixtures. However, the site evaluation also includes 12.1 kW of generator demand savings from the cooling interactions. There were no interactive demand savings in the tracking values.

Project ID: C-528984-1

1.0 Facility Overview

This facility is a large hotel in Downtown Dartmouth. The hotel contains numerous conference rooms, a large banquet hall, and a full service restaurant.

2.0 Summary of Savings and Adjustments

An extensive lighting retrofit performed in all areas of the hotel with the exception of guest rooms. The primary components of the project consisted of replacing T12 fixtures with low wattage T8 fixtures and retrofitting various recessed halogen fixtures with newer more efficient halogen lamps. In addition to retrofitting most of the fixtures in the hotel, occupancy sensors were also installed to control 12 pre-existing T3 Halogen fixtures.

Table 1 below presents a summary of the energy and demand savings for this project. Savings were recalculated based on a review of the program documentation and analysis, and verification of installed fixtures during the site visit. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 7.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 17.1% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	Customer Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	137,998	114,346	-23,652	15.3	15.7	0.4
Interactive Lighting	-644	-534	110	0.0	-0.1	-0.1
Total Savings	137,354	113,812	-23,542	15.3	15.6	0.3

	Generator Savings					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Lighting	147,796	122,464	-25,332	16.4	16.8	0.4
Interactive Lighting	-690	-571	118	0.0	-0.1	-0.1
Total Savings	147,106	121,893	-25,214	16.4	16.7	0.3

3.0 Project Overview

Table 2 below provides a summary of the new and pre-existing fixtures affected by this project.

Table 2: Summary of New and Pre-existing Fixtures

New Fixture Type	Quantity	Wattage	Pre-existing Fixture Type	Quantity	Wattage
100w T3 Hal w/ OC	12	100	100w T3 Hal	12	100
New 4L Wrap	2	86	4L F34T12	49	160
New 3L Troffer	43	65	2L F34T12	246	80
New 2L Wrap	5	43	1L F34T12	84	42
4L 84W RL/RB	1	84	1L F30T12	2	38
3L 65W RL/RB	3	65	1L F20T12	2	32
2L 43W RL/RB	217	43	75w PAR30LN	34	75
40w PAR38-IRC	237	40	75w PAR38	1	75
40w A19 HIR	3	40	60w PAR38	202	54
1L 25W RL/RB	4	25	60w A19	3	54
1L 22W RL/RB	106	22	50w A17	6	50
1L 14W RL/RB	2	14	50w BR20	10	50
120-volt MR16	19	20	PAR20	3	50
LED Retro Kit	1	1	Incandescent Exit	1	30

The fixture quantities listing in Table 2 reflect changes to the counts made during the evaluation. Note that line items do not match along rows in Table 2. Fixtures in the two “fixture type” columns were organized based on similarity of fixture types, with fixture wattages descending within any given type class. The first line item indicates the fixture wattages of the 12 fixtures that were placed on occupancy sensor controls.

It should be noted that this site installed measures subsequent to their participation in the program. While spillover was not explicitly quantified at the on-site, the installation of these added lights was related to program participation to the extent that the site contact had them put in as they were not sure if the original program installation was going to achieve the predicted savings. These measures were installed outside of the program and their savings are not being credited to the program under the gross savings work, although the circumstances surrounding their installation suggests they might be considered spillover had they been fully explored at the site.

4.0 Tracking Savings Review and Calculations

At the time of evaluation reporting, M&V analysis had not been completed for this project. As such, the savings methodology presented subsequently reflects the approach used to determine savings for the Project Development Agreement (PDA).

Savings were calculated for the PDA using a spreadsheet-based approach. The lighting retrofit was broken down into groups of lights by fixture type and location. For each group, the number of newly installed and pre-retrofit fixtures was listed. Savings for a given group were calculated as the difference between the installed wattage and the pre-existing wattage multiplied by the annual lighting operating hours for that group’s location. Savings from each group were then summed to estimate annual savings. In long form, the fundamental savings equation was,

$$E_{S-L} = \sum_i \frac{(n_{pre-i} W_{pre-i} - n_{post-i} W_{post-i}) h}{1000} \quad (1)$$

where,

E_{S-L} = Direct savings from the lighting retrofit (kWh)

n = Number of fixtures

W = Fixture wattage

i = Lighting group i

h = Assumed lighting annual hours of operation

1,000 = Wh to kWh conversion factor

The operating hours used in Equation 1 were based on daily operating schedule estimates provided by the site contact.

In addition to direct lighting savings, interactive heating and cooling savings were also claimed for this project. Since the new fixtures operate at lower wattages, and thus impart less heat to the building, they result in negative heating savings in the winter months and positive cooling savings in the summer months.

The net effect of the heating penalty and the cooling bonus was calculated with the following equation:

$$E_{S-inter} = \frac{E_{S-L} f_{h-c} f_{s-c}}{COP} - \frac{E_{S-L} f_{h-h} f_{s-h}}{\eta} \quad (2)$$

where,

$E_{S-inter}$ = Interactive Effects Savings [kWh]

E_{S-L} = Direct lighting savings [kWh]

f_{h-c} = Cooling season heat gain factor

f_{s-c} = Cooling season seasonality factor

f_{h-h} = Heating season heat gain factor

f_{s-h} = Heating season seasonality factor

COP = Cooling system coefficient of performance

η = Heating system efficiency

In Equation 2, heat gain factors designate the portion of lighting energy that ultimately becomes a heat load on the building. For the heating penalty, a heat gain factor of .156 was assumed. For the cooling bonus, a heat gain factor of 1 was used. It is not clear why such a large discrepancy between the heating and cooling heat gain factors exists. Nonetheless, NSPI used this approach in all of their lighting savings calculations, so it was left unchanged in the ensuing evaluation analysis for the sake of consistency.

The seasonality factors in Equation 2 account for the fact that heating and cooling are only required for portions of the year, and thus the additional lighting heat load may not necessarily result in additional HVAC equipment operation. Seasonality factors of .5 and .22 were used for the heating and cooling calculations respectively.

Energy savings for the 12 fixtures connected to occupancy sensors were calculated by assuming a 70% reduction in lighting runtime relative to the lights' previous operating schedule.

Peak demand savings for the entire project were calculated by applying a coincidence factor of .664 to the gross change in connected load for the building. The peak coincidence factor was determined by first finding the savings weighted average annual lighting schedule, calculated as,

$$h_{avg} = \frac{\sum_i h_i E_{s-i}}{\sum_i E_{s-i}} \quad (3)$$

where,

h_{avg} = Savings weighted average operating hours [h]

i = Lighting group i

h_i = Operating hours for lighting group i

E_{s-i} = Energy savings for lighting group i

The peak coincidence factor was then determined by dividing h_{avg} (5,813 hours) by 8,760 hours. Multiplying the peak coincidence factor by the gross connected load reduction resulted in the peak demand savings estimate. Demand savings from interactive effects were not considered in the tracking analysis.

The DSM Administrator intends to determine M&V projects savings using Metrix building analysis software instead of the pre-existing spreadsheets. Metrix uses historic utility bills to generate a baseline for the facility. It then conducts a savings analysis using post-measure implementation billing data in conjunction with weather data and other energy usage variables. According to the DSM Administrator, Metrix will be used instead of the pre-existing spreadsheet analysis because the lighting panels at the hotel are not well organized, making it difficult to obtain metered lighting data for desired building areas. Since the Metrix analysis was not available for review at the time of the evaluation, savings were calculated relative to the feasibility study savings values available in the tracking system.

5.0 On-Site Methodology

The on-site methodology consisted primarily of verifying the installation of as many claimed fixtures as possible. Of the 655 retrofit fixtures, a total of 582 fixtures (88.9%) were verified during the site visit. The verified fixtures accounted for 92.8% of the verified connected load reduction and 93.5% of the verified energy savings.

In addition to verifying lights in 61 of a possible 76 affected fixture groups, lighting operating schedules were discussed with the hotel's maintenance manager. The daily operating schedules for each lighting group used in the tracking analysis were reviewed with the maintenance manager and adjustments were made as necessary.

6.0 On-site Observations and Findings

In general, the fixture counts verified on-site matched the counts specified in the tracking savings spreadsheet. There was however one major exception. In the tracking analysis, fixture counts for the banquet room area appear to have been double counted. The tracking spreadsheet lists the banquet room under two separate entries as “Banquet Room” and “Salons A+B+C”. For the “Banquet Room” entry, the spreadsheet indicates that 135 PAR38 fixtures were retrofitted; for “Salons A+B+C”, the spreadsheet indicates that 136 PAR38 fixtures were retrofit. When the site contact was asked if there was any way the two listings could be for different areas of the building, he stated that the only area that matches the room titles and has 135 halogen fixtures is the banquet hall. The site contact’s statements confirmed that lighting savings for the banquet hall were accidentally double-counted in the tracking analysis. Aside from this one major discrepancy, fixture counts in the remainder of the verified areas were only off by a single fixture.

When discussing lighting operating schedules, the facility manager identified 17 fixture groups where the estimated operating hours were too high. In 13 cases, the predicted daily operating hours were longer than they are in practice. In 6 cases (2 overlapping with the others), lights were scheduled to operate seven days per week when they actually only operate Monday through Friday.

Subsequent to the site visit, project energy savings were calculated with the same fundamental calculations used in the tracking analysis. Only the fixture counts and lighting operating schedules were adjusted to reflect verified quantities.

The peak demand savings calculation was altered in two ways. Instead of using a single peak coincidence factor based on the savings weighted average operating schedule of the affected lights, peak coincidence factors were independently calculated for each affected lighting group. For a given lighting group, peak coincidence factors were calculated according to the following rules:

- If the daily operating hours were 18 or more, the peak coincidence factor was assumed to be 1.
- If the daily operating hours were less than 18, the peak coincidence factor was calculated as (daily operating hours)/18.

The first rule was set in place based on the assumption that if lights operate more 18 hours a day, then they most likely operate continuously during the 5 to 6 PM weekday peak period (as opposed to say 2 AM). If, however, the lights operate less than 18 hours a day, run hours are most likely to occur during the more normal hours of 6 AM to 12 AM. As such, the peak coincidence factors for groups with less than 18 daily run hours were calculated on the premise that all run hours occur between 6 AM and 12 AM, but the run hours are equally likely to occur at any point during that time frame. While these rules cannot identify peak coincidence factors with absolute certainty, they certainly improve upon the method used in the tracking analysis, which effectively assumed that lights were equally likely to be on at any hour.

In addition to updating the coincidence factors used in the savings analysis, a new method was introduced to calculate demand savings from interactive effects with building HVAC systems. Interactive effects demand savings were calculated for each lighting group as,

$$D_{S-inter} = \left(\frac{\Delta kW_L f_{h-c} f_{s-c}}{COP} - \frac{\Delta kW_L f_{h-h} f_{s-h}}{\eta} \right) CF \quad (3)$$

where,

$D_{S-inter}$ = Interactive effects demand savings [kW]

ΔkW_L = Connected load reduction

f_{h-c} = Cooling season heat gain factor

f_{s-c} = Cooling season seasonality factor

f_{h-h} = Heating season heat gain factor

f_{s-h} = Heating season seasonality factor

COP = Cooling system coefficient of performance

η = Heating system efficiency

CF = Peak demand period coincidence factor

In the above equation, heat gain factors and seasonality factors hold the same meaning as they did in Equation 2. The coincidence factor accounts for the fact that lights may not necessarily operate during the peak demand period. Equation 3 was applied to all retrofitted areas of the building served by HVAC systems (100% in this case). Savings from all areas were summed to arrive at interactive effects peak demand savings.

7.0 Conclusions

Annual energy savings were 82.9% of the tracking savings. The reduction in energy savings partially resulted from removing the double counted savings in the banquet hall section of the hotel. Removing this lighting group alone reduced the savings estimate by over 8,400 kWh. In addition, the savings were reduced considerably by decreasing the annual operating hours for 16 fixture groups. It is worth noting that as of this reporting, the Metrix M&V analysis currently being conducted by the DSM Administrator shows 79,733 kWh of customer energy savings through the first 10 months of 2010. Extrapolating these savings to a full year (multiplying by 12/10) yields projected savings of 95,680 kWh.

Unlike energy savings, the evaluated peak demand savings exceeded the tracking projection by 1.9%. Peak demand savings were increased primarily because the coincidence factors used in the evaluation analysis were generally larger than the tracking coincidence factor. As discussed previously, the coincidence factor used in the tracking analysis was .664; in the evaluation analysis, the load reduction weighted average peak coincidence factor was .761. Increasing the peak demand coincidence factor more or less offset the demand savings reductions caused by removing the double counted lights and accounting for the slightly negative interactive effects demand savings.

Project ID: C-675561-1

1.0 Facility Overview

This facility manufactures disposable paper food products such as plates, bowls and egg cartons. The business runs a continuous manufacturing process 24 hours per day, seven days per week.

2.0 Summary of Savings and Adjustments

An extensive motor retrofit project was completed at this facility during the 2009 and 2010 program years. Prior to the retrofit, the facility had 93 motors 20 hp or larger in size. Of these motors, 42 were selected for retrofit based on their potential for energy savings. In each case, the less efficient preexisting motor was swapped out for a new premium efficiency motor of equivalent size.

Following verification of motor installation during the site visit, savings were recalculated using motor operating data collected from the site contact and logged amperage data collected as part of the DSM Administrator's M&V. Table 1 below presents a summary of the energy and demand savings claimed for this motor retrofit project in the 2010 program year. Only 20% of the gross project savings were claimed for 2010 since the majority of the retrofit was completed during the 2009 project year. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus a 4.1% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 14.3% less than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

<i>Customer Savings</i>						
<i>kWh</i>				<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Motors	74,214	63,611	-10,602	10.2	7.3	-2.9

<i>Generator Savings</i>						
<i>kWh</i>				<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Motors	77,256	66,220	-11,037	10.7	7.6	-3.0

3.0 Project Overview

Table 2 below provides an overview of the installed motors, as well as the baseline motors that were removed:

Table 2: Summary of Installed and Replaced Motors

Item #	Preexisting HP	Preexisting Efficiency	Installed HP	Installed Efficiency
1	20	89.1	20	93.0
2	20	Unknown	20	93.0
3	25	90.0	25	93.6
4	25	90.0	25	93.6
5	25	90.0	25	93.6
6	25	90.0	30	93.6
7	25	90.0	25	93.6
8	25	90.0	25	93.6
9	25	90.0	25	93.6
10	30	90.1	30	93.0
11	30	90.6	30	93.6
12	30	90.6	30	93.6
13	40	89.5	40	91.7
14	50	91.6	50	94.5
15	50	91.6	50	94.5
16	50	91.6	50	94.1
17	50	91.6	50	94.1
18	50	91.6	50	94.1
19	50	91.6	50	94.1
20	50	91.6	50	94.1
21	50	91.6	50	94.1
22	50	92.3	50	94.1
23	50	91.6	50	94.1
24	50	91.6	50	94.1
25	50	91.6	50	94.1
26	50	91.6	50	94.5
27	75	92.2	75	95.4
28	75	92.2	75	95.4
29	75	91.9	75	95.0
30	75	91.9	75	95.0
31	75	91.9	75	94.5
32	75	91.9	75	95.0
33	75	91.9	75	95.0
34	75	91.9	75	95.0
35	75	91.9	75	95.0
36	75	91.9	75	95.0
37	75	91.9	75	95.0
38	75	91.9	75	95.0
39	100	92.8	100	95.0
40	150	93.3	150	96.2
41	150	92.4	150	96.2
42	150	92.4	150	96.2

Note that the motor efficiencies and sizes listed in Table 2 reflect changes made during the evaluation. With respect to motor size, only motor #6 was changed based on site conditions.

4.0 Tracking Savings Review and Calculations

At the time of program evaluation, the DSM Administrator had not yet completed M&V work for this project. As such, the tracking savings presented for this project are based on the work completed for the Project Development Agreement (PDA).

Tracking savings were calculated using a spreadsheet-based approach. Since the same analysis was conducted for each motor, the approach for a single representative motor is presented below. Before proceeding, it should be noted that there were mistakes in the tracking analysis. These errors are discussed subsequent to the analysis approach.

The analysis begun by first calculating the power factor of the preexisting motor:

$$PF_{Pre} = \frac{HP_{Pre}}{\eta_{Pre}(\sqrt{3}A_{Pre})V} * 746 \quad (1)$$

where,

PF_{Pre} = Preexisting Motor Power Factor

HP_{Pre} = Preexisting Motor Nameplate Horsepower [HP]

η_{Pre} = Preexisting Motor Nameplate Efficiency

$\sqrt{3}$ = Phase-to-Phase Conversion Factor

A_{Pre} = Preexisting Motor Phase-to-Ground Full Load Amperage [A]

V = Phase-to-Phase Voltage [V]

746 = Horsepower to Watts Conversion Factor [W/HP]

Next, the power factor of the installed motor was calculated:

$$PF_{Inst} = \frac{HP_{Inst}}{\eta_{Inst}(\sqrt{3}A_{Pre})V} * 746 \quad (2)$$

where,

PF_{Inst} = Installed Motor Power Factor

HP_{Inst} = Installed Motor Nameplate Horsepower [HP]

η_{Inst} = Installed Motor Nameplate Efficiency

$\sqrt{3}$	= Phase-to-Phase Conversion Factor
A_{Pre}	= Preexisting Motor Phase-to-Ground Full Load Amperage [A]
V	= Phase-to-Phase Voltage [V]
746	= Horsepower to Watts Conversion Factor [W/HP]

Notice that in the above equation, the nameplate amperage of the preexisting motor is used. When this amperage is used in conjunction with the higher efficiency of the installed motor, it results in a lower power factor for the installed motor than the preexisting motor. Why this approach was used—instead of simply taking the nameplate power factor from the installed motor—is unclear.

The power draw of the preexisting motor was then calculated using the average of roughly one hour's worth of amperage data collected from all three phases:

$$kW_{Pre} = \frac{\sqrt{3}VA_{Meas}PF_{Inst}}{1000} \quad (3)$$

where,

kW_{Pre}	= Preexisting Motor Power Draw [kW]
$\sqrt{3}$	= Phase-to-Phase Conversion Factor
V	= Phase-to-Phase Voltage [V]
A_{Meas}	= Logged average Phase-to-Ground amperage [A]
PF_{Inst}	= Installed Motor Power Factor
1000	= Watt to kW conversion factor [W/kW]

In the above equation, the *installed* motor's power factor is used instead of the pre-existing motor's power factor.

Based on the preexisting motor's power draw, the installed motor's power draw was next calculated as,

$$kW_{Inst} = kW_{Pre} \frac{\eta_{Pre}}{\eta_{Inst}} \quad (4)$$

where,

kW_{Inst}	= Installed Motor Power Draw [kW]
kW_{Pre}	= Preexisting Motor Power Draw [kW]
η_{Pre}	= Preexisting Motor Efficiency

η_{Inst} = Installed Motor Efficiency

Finally, savings for a given motor were calculated as follows:

$$E_S = (kW_{Pre} - kW_{Post})h \quad (5)$$

where,

E_S = Installed Motor Energy Savings [kWh]

kW_{Pre} = Preexisting Motor Power Draw [kW]

kW_{Post} = Installed Motor Power Draw [kW]

h = Annual Operating Hours [h]

The operating hours, h , used in Equation 5 were calculated based on the percentage of the amperage logging period (roughly one hour) during which the recorded amperage was greater than zero. That percentage was then multiplied by 8,760 to estimate annual operating hours.

Peak demand savings were calculated by multiplying the gross connected load reduction by a coincidence factor of (8,585/8,760), where 8,585 is the facility's annual operating hours.

Since the majority of the project was implemented during the 2009 program year, only 20% of the total project savings were attributed to 2010. Gross project energy and demand savings were therefore simply multiplied by .2 to arrive at the 2010 program year savings.

Upon review, the following key issues were identified with the tracking analysis:

- An incorrect methodology based on the nameplate amperages of the preexisting motors was used to calculate the power factor of the installed motors.
- The operating power of the preexisting motors was determined using the incorrectly calculated power factors of the installed motors instead of the preexisting motors' power factors.
- Annual operating hours were calculated based on a very small sample of operating data (roughly one hour).
- The peak demand savings calculation did not take into account variations in individual motor usage during the facility's operating schedule.

These issues were subsequently addressed in the evaluation analysis.

5.0 On-Site Methodology

During the site visit, the installation of the proposed motors was verified by visually inspecting the motors and recording nameplate data, including model number, horsepower, nominal efficiency, and rated power factor (when available). 38 of the 42 installed motors were directly verified. The other four motors were installed in inaccessible locations where verification of nameplate data was not possible.

In addition to verifying motor installations, the pre- and post-implementation amperage data logging strategies were discussed with the facility technician responsible for the logger installations. Motor

operating hours were also discussed to determine if the values used in the tracking analysis were appropriate.

6.0 On-site Observations and Findings

Each of the 38 motors that could be directly verified was replaced as proposed. However, the specifications of the installed motors differed slightly from the specifications listed in the tracking analysis spreadsheet. Table 3 below compares the tracking horsepower and efficiency specifications with the evaluated specifications confirmed on-site. Motors that could not be verified directly are bolded and italicized.

Table 3: Summary of Installed and Replaced Motors

Item #	Claimed HP	Claimed Efficiency	Evaluated HP	Evaluated Efficiency	Delta Efficiency
1	20	91.7	20	93.0	1.3
2	20	93.0	20	93.0	0.0
3	25	93.6	25	93.6	0.0
4	25	93.6	25	93.6	0.0
5	25	93.6	25	93.6	0.0
6	25	93.6	30	93.6	0.0
7	25	93.6	25	93.6	0.0
8	25	93.6	25	93.6	0.0
9	25	93.6	25	93.6	0.0
10	30	93.0	30	93.0	0.0
11	30	93.6	30	93.6	0.0
12	30	93.6	30	93.6	0.0
13	40	92.4	40	91.7	-0.7
14	50	94.5	50	94.5	0.0
15	50	94.5	50	94.5	0.0
16	50	94.1	50	94.1	0.0
17	50	94.1	50	94.1	0.0
18	50	94.1	50	94.1	0.0
19	50	94.1	50	94.1	0.0
20	50	94.1	50	94.1	0.0
21	50	94.1	50	94.1	0.0
22	50	94.1	50	94.1	0.0
23	50	94.1	50	94.1	0.0
24	50	94.1	50	94.1	0.0
25	50	94.1	50	94.1	0.0
26	50	94.5	50	94.5	0.0
27	75	95.4	75	95.4	0.0
28	75	95.4	75	95.4	0.0
29	75	94.5	75	95.0	0.5
30	75	94.5	75	95.0	0.5
31	75	94.5	75	94.5	0.0
32	75	94.5	75	95.0	0.5
33	75	94.5	75	95.0	0.5
34	75	94.5	75	95.0	0.5
35	75	94.5	75	95.0	0.5
36	75	94.5	75	95.0	0.5
37	75	94.5	75	95.0	0.5
38	75	94.5	75	95.0	0.5
39	100	95.0	100	95.0	0.0
40	150	95.8	150	96.2	0.4
41	150	95.8	150	96.2	0.4
42	150	95.8	150	96.2	0.4

Notice that in all cases but one (Item 13), the specifications of the installed motors met or exceed the specifications claimed in the tracking analysis.

In addition to gathering data off motor nameplates, revised operating hour data for each of the installed motors were collected from the site contact. As part of a power factor correction project being undertaken at the facility, the site contact was required to determine the weekly run times for each motor in the facility. These run times, which are largely based on production schedules, were provided for use in the evaluation analysis. Table 4 below summarizes the key parameters collected for each of the installed motors. The values in Table 4 fed directly into the evaluation analysis.

Table 4: Summary of Key Installed Motor Parameters

Item #	Horsepower	Efficiency	Power Factor	Weekly Run Hours	Average Monitored Amperage
1	20	93.0	83.8	168	Not Logged
2	20	93.0	83.8	168	10.3
3	25	93.6	84.6	126	21.7
4	25	93.6	84.6	126	20.9
5	25	93.6	84.6	126	Not Logged
6	30	93.6	83.1	0	Not Logged
7	25	93.6	84.6	0	Not Logged
8	25	93.6	84.3	146	24.3
9	25	93.6	84.3	122	30.9
10	30	93.0	79.0	112	87.2
11	30	93.6	83.1	168	31.3
12	30	93.6	83.1	168	73.8
13	40	91.7	90.0	168	43.0
14	50	94.5	84.2	112	27.2
15	50	94.5	84.2	118	Not Logged
16	50	94.1	80.6	151	28.4
17	50	94.1	80.6	140	57.0
18	50	94.1	80.6	140	53.6
19	50	94.1	80.6	122	57.0
20	50	94.1	80.6	116	53.3
21	50	94.1	80.6	136	64.2
22	50	94.1	80.6	121	22.1
23	50	94.1	80.6	146	72.7
24	50	94.1	80.6	146	59.6
25	50	94.1	80.6	122	76.2
26	50	94.5	84.2	168	42.2
27	75	95.4	85.6	168	67.0
28	75	95.4	85.6	0	Not Logged
29	75	95.0	88.9	168	78.0
30	75	95.0	88.9	168	82.5
31	75	94.5	85.0	168	77.7
32	75	95.0	85.1	168	74.3
33	75	95.0	85.1	168	82.6
34	75	95.0	85.1	168	65.7
35	75	95.0	88.9	168	65.3
36	75	95.0	85.1	168	61.4
37	75	95.0	85.1	168	65.0
38	75	95.0	85.1	168	69.9
39	100	95.0	85.6	130	110.2
40	150	96.2	88.5	40	33.3
41	150	96.2	88.5	40	Not Logged
42	150	96.2	88.5	40	Not Logged

Using the data collected on-site, a revised analysis methodology was employed to correct for the errors in the tracking analysis. For the 34 motors where roughly one hour of amperage data (all three phases monitored, sampled every 8 seconds) were collected following implementation, savings were calculated on the basis of this post-installation amperage data. Equation 6 below demonstrates the calculation methodology used in these 34 instances:

$$E_S = \frac{\sqrt{3}VA_{Meas-Post}PF_{Inst}}{1000} \left(\frac{\eta_{Inst}}{\eta_{Pre}} - 1 \right) h_{week} \left(\frac{365}{7} \right) \quad (6)$$

where,

E_S	= Annual Energy Savings [kWh]
$\sqrt{3}$	= Phase-to-Phase Conversion Factor
V	= Phase-to-Phase Voltage [V]
$A_{Meas-Post}$	= Post-installation Average Phase-to-Ground Amperage [A]
PF_{Inst}	= Installed Motor Power Factor
1000	= Watt to kW Conversion Factor [W/kW]
η_{Inst}	= Installed Motor Nominal Efficiency
η_{Pre}	= Preexisting Motor Nominal Efficiency
h_{week}	= Weekly Operating Hours [h]
$\frac{365}{7}$	= Annual Schedule Scale Factor

In the remaining 8 instances where only pre-installation logged amperage data were available, savings were calculated as,

$$E_S = \frac{\sqrt{3}VA_{Meas-Pre}PF_{Pre}}{1000} \left(1 - \frac{\eta_{Pre}}{\eta_{Inst}} \right) h_{week} \left(\frac{365}{7} \right) \quad (7)$$

where,

E_S	= Annual Energy Savings [kWh]
$\sqrt{3}$	= Phase-to-Phase Conversion Factor
V	= Phase-to-Phase Voltage [V]
$A_{Meas-Pre}$	= Pre-installation Average Phase-to-Ground Amperage [A]
PF_{Pre}	= Preexisting Motor Power Factor
1000	= Watt to kW Conversion Factor [W/kW]

η_{Inst} = Installed Motor Nominal Efficiency

η_{Pre} = Preexisting Motor Nominal Efficiency

h_{week} = Weekly Operating Hours [h]

$\frac{365}{7}$ = Annual Schedule Scale Factor

In cases where both pre- and post-installation amperage data were available, savings were not calculated using both data sets. After analyzing the data, it immediately became apparent that the loads placed on many of the motors during the post-installation period had shifted significantly. In some cases the post-implementation amperage was considerably higher than the pre-installation amperage; in other cases, the opposite was true. Comparing pre- and post-installation logged amperage data would not have yielded in a valid result. For this reason, in cases where both pre- and post-installation amperage data were available for the analysis, the post-amperage data and Equation 6 were used since the post-installation data are more representative of current facility conditions; Equation 7 was used in all other instances since a more appropriate recourse was unavailable.

Since the facility operates continuously, demand savings for a given motor are generally just as likely to occur in any one hour as the next. With this in mind, peak demand savings were calculated using the following methodology in cases where post-installation amperage data were available:

$$E_S = \frac{\sqrt{3}VA_{Meas-Post}PF_{Inst}}{1000} \left(\frac{\eta_{Inst}}{\eta_{Pre}} - 1 \right) \frac{h_{week}}{168} \quad (8)$$

All variables in the above equation were defined as in Equation 6. The parameter, $\frac{h_{week}}{168}$, acts as a coincidence factor, scaling the demand savings with respect to typical weekly operating hours.

Similarly, in instances where only pre-implementation metered data were available, peak demand savings were calculated as:

$$E_S = \frac{\sqrt{3}VA_{Meas-Pre}PF_{Pre}}{1000} \left(1 - \frac{\eta_{Pre}}{\eta_{Inst}} \right) \frac{h_{week}}{168} \quad (9)$$

As in the tracking analysis, gross energy and peak demand savings were multiplied by .2 to account for the fact that only 20% of the project savings are attributable to the 2010 program year.

7.0 Conclusions

Annual energy savings were 85.7% of the tracking estimate. The shift in energy savings was primarily attributable to the following factors:

- Adjustments to the way in which the post-installation power factors were calculated and applied to the savings analysis (net positive effect on savings)
- Adjustments to the efficiencies of the installed motors (net positive effect on savings)

- Adjustments to the operating hours of the installed motors based on facility data (net negative effect on savings)
- Usage of post-implementation metered data (indeterminate effect)

Overall, reducing motor operating hours relative to the tracking operating hours appears to have had the largest effect on the energy savings estimate.

Evaluated peak demand savings were 71.5% of the tracking estimate. Differences in the implementation of peak coincidence factors were primarily to blame for this discrepancy. The coincidence factor used in the tracking savings calculation (.98) was considerably higher than the average coincidence factor used in the evaluation analysis (.76). In the evaluation analysis, unique coincidence factors were applied to each motor based on their weekly operating schedules; in the tracking analysis, a single peak coincidence factor was applied to the gross connected load reduction based only on facility operating hours.

In summation, evaluation changes to the energy and demand savings did not result from incorrect equipment being installed, but rather from necessary changes to the savings calculation methodology.

Project ID: C-764959-2

1.0 Facility Overview

Traffic lights throughout a regional municipality were replaced as part of this project. As with any city, traffic lights are required to operate 24 hours per day, 7 days a week, 365 days a year.

2.0 Summary of Savings and Adjustments

This project consisted of replacing the incandescent traffic signals at 108 intersections with new LED signals. All signals, including circular traffic signals, arrows, pedestrian walk signals, and pedestrian countdown signals, were replaced.

Following verification of selected intersections during the site visit, savings were recalculated using pre- and post-implementation fixture counts provided by the site contact and revised scheduling data calculated as part of the evaluation. Table 1 below presents a summary of the energy and demand savings achieved through this traffic lighting retrofit during the 2010 program year. As of years end, 14 of the 108 intersections slated for retrofits had yet to be addressed. In Table 1, customer savings refers to energy and demand savings at the site. Generator savings are customer savings plus an 11.3% scale factor to account for transmission and distribution losses. The evaluated energy savings were ultimately 7.0% more than the tracking savings.

Table 1: Summary of Tracking and Evaluation Savings Results

	<i>Customer Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Traffic Lighting	1,107,389	1,184,556	77,167	125.7	135.2	9.6

	<i>Generator Savings</i>					
	<i>kWh</i>			<i>kW</i>		
	Tracking	Evaluated	Difference	Tracking	Evaluated	Difference
Traffic Lighting	1,232,524	1,318,411	85,887	139.9	150.5	10.6

3.0 Project Overview

Table 2 below provides an overview of the installed LED lights, as well as the baseline incandescent lights that were removed:

Table 2: Summary of Pre-existing Incandescent and New LED Fixtures

Incandescent Fixture Type	Quantity	Wattage	LED Fixture Type	Quantity	Wattage
12" Red	824	135	12" Red	969	6
12" Yellow	267	135	12" Yellow	427	17
12" Green	262	135	12" Green	422	12
12" Yellow Arrow	98	135	12" Yellow Arrow	8	8
12" Green Arrow	89	135	12" Green Arrow	17	7
8" Red	170	60	12" Bi-modal Arrow	81	7
8" Yellow	718	60	8" Yellow	534	14
8" Green	719	60	8" Green	535	9
8" Yellow Arrow	8	60	Bi-modal Pedestrian Signal	681	6
Pedestrian Signal	689	69	Pedestrian Countdown	353	9
Total Fixtures	3,844		Total Fixtures	4,027	
Total Connected Load (kW)	352.3		Total Connected Load (kW)	38.4	

Note that the fixture quantities listed in Table 2 reflect changes made during the evaluation.

4.0 Tracking Savings Review and Calculations

Since the project was not complete as of the end of the 2010 program year, savings in the tracking system were not updated from their Project Development Agreement (PDA) values. The tracking savings presented in Table 1 reflect savings achieved during 2010 according to the PDA. Nonetheless, the M&V savings analysis for fixtures retrofit in the 2010 program year was mostly finalized at the time of evaluation. Therefore, the M&V approach, as opposed to the PDA approach, is presented subsequently because it reflects the methodology NSPI will use to finalize project savings.

M&V savings were calculated using a spreadsheet based approach. For each intersection, the annual energy consumption of the pre-existing and installed fixtures was calculated. Energy consumption was determined for each fixture type at a given intersection on the basis of fixture quantity, wattage, and operating schedule. Operating schedules for each light type and color were developed by multiplying 8,760 hours by an operating factor to account for the percentage of time lights of a particular type/color combination were assumed to operate.

After determining energy consumption for the pre-existing and installed fixtures at every intersection, savings were subsequently calculated by subtracting the installed case annual energy consumption from the pre-existing case annual energy consumption. In long form, energy savings were calculated as,

$$E_s = \sum_i^j 8760 \sum_k \frac{n_{inc-k} W_{inc-k} f_{inc-k}}{1000} - \sum_i^j 8760 \sum_l \frac{n_{LED-l} W_{LED-l} f_{LED-l}}{1000} \quad (1)$$

where,

E_s = Direct savings from the lighting retrofit (kWh)

8,760 = Annual Hours [hours]

- i = Intersection number
- j = Quantity of affected intersections
- k = Incandescent light of type and color k
- l = LED light of type and color l
- n_{inc-k} = Incandescent fixture quantity
- W_{inc-k} = Incandescent fixture wattage [W]
- f_{inc-k} = Incandescent fixture operating factor
- n_{LED-l} = LED fixture quantity
- W_{LED-l} = LED fixture wattage [W]
- f_{LED-l} = LED fixture operating factor
- 1009 = W to kW conversion factor

The various operating schedule factors, f_{inc-k} and f_{LED-l} , used in the analysis were derived based on a series of assumptions. The first assumption was that at a standard intersection, one direction is typically red and the other direction is green. Therefore green lights were illuminated roughly 47% of the time, yellow lights were illuminated 2% of the time, and red lights operated 51% of the time. Red lights were assumed to operate slightly longer than 50% of the time to account for brief periods during which only red lights were illuminated in all directions.

Green arrows were assumed to operate only 30% of the time since they typically do not run for the full duration of the green light cycle. Yellow arrows were assumed to operate 2% of the time just like standard yellow signals.

For the LED lights only, pedestrian “walk” signals were assumed to operate half the time traffic signals are green and yellow, or roughly 25% of the time. “Don’t walk” signals were assumed to flash during the remainder of the green signal cycle (12.5% of the time due to flashing) and run continuously during the red light cycle for a total operating percentage of 62.5%. Countdown pedestrian timers were assumed to operate concurrently with the flashing “don’t walk” signals, or 25% of the time since they do not flash.

Incandescent pedestrian signals, which draw the same amount of current when displaying “walk” and “don’t walk” images, were assumed to operate only 87.5% of the time since the second half of the green light cycle displays a flashing red hand.

Table 3 below displays the full schedule of operating factors used in the M&V savings analysis.

Table 3: Summary of M&V analysis signal type operating factors

Signal Type	Operating Factor
Green Traffic Signal	47.0%
Yellow Traffic Signal	2.0%
Red Traffic Signal	51.0%
Green Arrow	30.0%
Yellow Arrow	2.0%
LED Pedestrian "Walk"	25.0%
LED Pedestrian "Don't Walk"	62.5%
LED Pedestrian Countdown	25.0%
Incandescent Pedestrian	87.5%

Peak demand savings for each intersection were calculated based on the lighting combinations that yield the highest instantaneous power draw at the intersection. For LED intersections, this combination consisted of having all PED walk/don't walk signals in operation, with one direction signaling red and the other direction signaling yellow. For incandescent intersections, instances where all directions signaled red and each pedestrian signal was illuminated constituted the highest power draw. For each intersection, the instantaneous peak demand for the LED case was then subtracted from the instantaneous peak demand of the incandescent case to calculate demand savings. Demand savings from each intersection were then summed to calculate project demand savings.

5.0 On-Site Methodology

The evaluation-site visit for this project consisted of two components: visiting the municipality's traffic office to inspect examples of the newly installed fixtures and driving throughout the municipality to inspect randomly selected intersections.

While visiting the traffic office, fixture wattages of all available LED lighting types were recorded. In addition, the site contact was asked to provide a list of all intersections affected by the project. The provided list indicated the quantities of new LED fixtures that had been installed at each intersection, as well as the quantities of incandescent fixtures that had been removed. The list also indicated intersections that were part of the project, but had not yet been retrofit.

Using the site contact's list, 11 intersections were visited to verify that the LED lights had been installed and that the fixture counts for each light type matched the quantities documented in the list.

6.0 On-site Observations and Findings

Example LED fixtures for a variety of traffic lights were available for review at the traffic office. Table 4 below lists the fixture types and wattages verified at the traffic office and compares the wattages to values used in NSPI's M&V analysis.

Table 4: Summary of verified and M&V signal wattages

Signal Type	Verified Wattage	M&V Wattage
12" Green Traffic Signal	12	12
12" Amber Traffic Signal	13	17
12" Red Traffic Signal	6	6
12" Bimodal Arrow	7	7
12" Green Arrow	8	7
12" Yellow Arrow	7	8
8" Green Traffic Signal	9	9
8" Amber Traffic Signal	10	14
PED Walk/Don't Walk Signal	6	6
PED Countdown	Unverified	9

Although the verified wattages were lower than the wattages used in the M&V analysis, the site contact noted that the light types used throughout the project have changed. As such, the M&V wattages may have been correct for lights installed earlier in the project. For the sake of consistency, fixture wattages were not adjusted in the evaluation analysis. Since the M&V LED wattages were typically higher than the verified wattages, they provide a lower bound for the project's savings.

After inspecting sample LED lights, the site contact provided a spreadsheet documenting the affected intersections and quantities of each type of light installed at each intersection. According to the spreadsheet, 95 of the 108 intersections affected by this project were retrofitted within the 2010 project year; an identical number of intersections were claimed in both NSPI's tracking and M&V analyses.

Using the intersection list provided by the site contact, 11 intersections distributed throughout the municipality were visited. Table 5 below lists the verified and M&V fixture counts for each inspected intersection and notes any discrepancies between the two data sets.

Table 5: Summary of verified and M&V fixture counts for inspected intersections

	12" Red	12" Yellow	12" Green	12" Bi-modal Arrow	12" Yellow Arrow	12" Green Arrow	8" Yellow	8" Green	PED Walk	PED Count-down
Verified Counts										
Intersection 1	9	4	4	0	0	0	5	5	8	0
Intersection 2	10	4	4	0	0	0	6	6	8	0
Intersection 3	16	11	9	2	2	4	2	2	10	8
Intersection 4	13	6	6	2	0	0	6	7	8	8
Intersection 5	10	6	6	0	0	4	4	4	8	8
Intersection 6	11	4	4	0	0	0	7	7	8	4
Intersection 7	8	5	5	2	0	0	3	3	4	2
Intersection 8	13	5	5	2	0	0	8	8	8	0
Intersection 9	10	8	8	0	0	0	2	2	8	8
Intersection 10	9	4	4	0	0	0	5	5	7	3
Intersection 11	13	4	4	0	0	0	9	9	8	8
M&V Counts										
Intersection 1	10	3	3	0	0	0	7	7	8	0
Intersection 2	10	4	4	0	0	0	6	6	8	0
Intersection 3	15	11	8	2	2	5	2	2	10	8
Intersection 4	13	7	7	2	0	0	6	6	8	8
Intersection 5	10	6	6	0	0	4	4	4	8	8
Intersection 6	10	3	3	0	0	0	7	7	8	4
Intersection 7	8	6	6	2	0	0	2	2	4	2
Intersection 8	12	5	5	2	0	0	7	7	8	4
Intersection 9	10	8	8	0	0	0	2	2	8	8
Intersection 10	9	3	3	0	0	0	6	6	8	4
Intersection 11	13	4	4	0	0	0	9	9	8	8
Discrepancies										
Intersection 1	-1	1	1	0	0	0	-2	-2	0	0
Intersection 2	0	0	0	0	0	0	0	0	0	0
Intersection 3	1	0	1	0	0	-1	0	0	0	0
Intersection 4	0	-1	-1	0	0	0	0	1	0	0
Intersection 5	0	0	0	0	0	0	0	0	0	0
Intersection 6	1	1	1	0	0	0	0	0	0	0
Intersection 7	0	-1	-1	0	0	0	1	1	0	0
Intersection 8	1	0	0	0	0	0	1	1	0	-4
Intersection 9	0	0	0	0	0	0	0	0	0	0
Intersection 10	0	1	1	0	0	0	-1	-1	-1	-1
Intersection 11	0	0	0	0	0	0	0	0	0	0

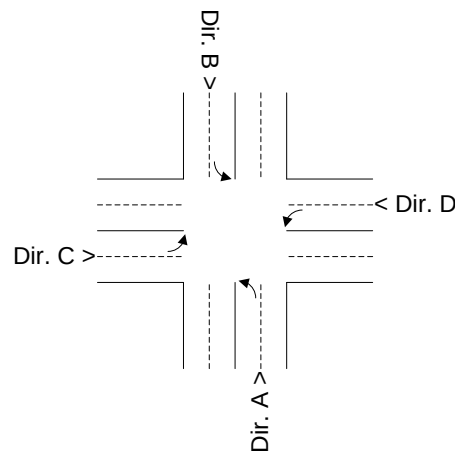
In general, the discrepancies were relatively minor and were not all biased in the same direction. However, it is slightly disconcerting that of the 11 verified intersections, fixture counts were amiss in 7 cases. Nonetheless, since the discrepancies were rather trivial, it was not deemed necessary to verify additional intersections or apply any form of fixture count scale factor to the remaining unverified intersections.

Using the incandescent and LED fixture counts provided by the site contact, as well as the updated LED counts for the verified intersections, energy savings were calculated using the M&V analysis algorithm in

Equation 1. Although the same fundamental calculation was used, significant updates were made to the operating factors used in the savings analysis.

The operating factors used in the M&V analysis were in error because protected left turns were not addressed. In general, if an intersection has left turn arrows, there are periods in the light cycle during which left turns are protected. When a left turn is protected, only left turn arrows are green and people turning left no longer have to yield to oncoming traffic.

Figure 1: Standard Four Way Intersection



In the M&V analysis, it was assumed that circular traffic signals were green for roughly 50% of the time in any direction and left turn arrows were green for 30% of the time. In order to illustrate why this is a problem, consider the perspective of a driver at the four way intersection depicted in Figure 1 moving in direction A. If the left turn signals in the direction A and direction B were to both turn green for 30% of a cycle, then the straight ahead green circles in the same two directions could not be illuminated simultaneously or else there would be collisions. However, if the green arrows in directions A and B were to operate for 30% of the cycle, followed by the straight ahead green signals in the same directions for 50% of the cycle, then only 20% of the cycle would be left for cars traveling in directions C and D. In essence, the lighting cycling strategy proposed in the M&V analysis overstated the amount of time any signal was green, and understated the amount of time any signal was red for all intersection with protected left turns.

To account for these issues, new operating fractions were devised for the evaluation analysis. To begin, all intersections with left turn arrows were assumed to be “protected” intersections, while all intersections without left turn arrows were assumed to be “permissive” intersections, i.e. intersections without protected left turns. The timings at a typically four way intersection differ under these two scenarios.

For the protected intersection case, operating fractions were determined with the following train of logic. First consider the typical four way intersection in Figure 1 from the perspective of drivers traveling in Directions A and B. Drivers traveling from at least one of these two directions are moving roughly 49.5% of the time; drivers traveling in the other two directions are moving the other 49.5% of the time. During the remaining 1% of a given cycle, all lights are red. Within the 49.5% of the time that drivers traveling in either direction A or B are moving (called “Split A” subsequently), the lighting cycle is typically be divided among the following three combinations:

- During the first part of Split A (16.5% of the cycle), drivers traveling in direction A have a straight ahead green signal and a green left turn arrow. At the end of this part of Split A, the left turn arrow switches to yellow (2% of the cycle).
- During the second part of Split A (16.5% of the cycle), the straight ahead green signal stays on in direction A and the straight ahead green signal turns on in direction B. At the end of the second part of Split A, the straight ahead yellow signal turns on in direction A (2% of the cycle).
- During the third part of Split A (16.5% of the cycle), the straight ahead green signal in direction B stays on and the green left turn arrow in direction B turns on. At the end of the third part of Split A, both the left turn and straight ahead signals turn yellow (2% of the cycle).

All the while this is happening, the lights in directions C and D are red. The same process is then be repeated in directions C and D. Timing wise, this operating strategy means that a typical straight ahead green signal operates 31% of the time ($16.5\% + 16.5\% - 2\%$), a green left turn signal operates 14.5% of the time ($16.5\% - 2\%$), and straight ahead yellow signals and yellow left turn signals both operate 2% of the time. Red lights associated with signals containing only straight ahead circular signals operate 67% of the time ($100\% - 31\% - 2\%$). Red lights associated with signal heads including both arrows and circular lights also operate 67% of the time because some combination of the straight ahead green signal, the green arrow, and one of the two yellows is on during the remaining 33% of the time ($16.5\% + 16.5\%$).

With respect to pedestrian signals, it is assumed that “walk” signals in any direction are illuminated for half of the period during which either the green or yellow circular signals are illuminated, or 16.5% of the time ($[31\% + 2\%]/2$). For the other half of this portion of the lighting cycle, the “don’t walk” signals flash. The “don’t walk” signal also remains on for the duration of the red cycle, for a total operating factor of 75.25% ($16.5\%/2 + 67\%$). The pedestrian countdown signals are assumed to operate continuously during the second half of the straight ahead green/yellow light cycle, or 16.5% of the time.

At permissive intersections, the timings are very similar to those used in the M&V analysis. Since there are no left-turn-only cycles, the straight ahead light is green 47.5% of the time from the perspective of a driver. The yellow light is illuminated 2% of the time and the red light operates for the remaining 50.5% of the time. As with protected intersections, the pedestrian “walk” signal operates for half of the green/yellow light cycle, or 24.75% of the time. The “don’t walk” signal flashes for the other half of the green/yellow light cycle and then remains on during the red light cycle, yielding a 62.875% operating factor ($24.75\%/2 + 50.5\%$). The pedestrian countdown signals are assumed to operate continuously during the second half of the green/yellow light cycle, or 24.75% of the time.

Table 6 below provides a summary of the operating factors used in the evaluation analysis for both protected and permissive intersections.

Table 6: Summary of evaluation analysis operating factors

Signal Type	Protected Left Operating Factor	Permissive Left Operating Factor
Green Traffic Signal	31.000%	47.500%
Yellow Traffic Signal	2.000%	2.000%
Red Traffic Signal (for Straight)	67.000%	50.500%
Green Arrow	14.500%	N/A
Yellow Arrow	2.000%	N/A
Red Traffic Signal (for Arrow)	67.000%	N/A
LED Pedestrian "Walk"	16.500%	24.750%
LED Pedestrian "Don't Walk"	75.250%	62.875%
LED Pedestrian Countdown	16.500%	24.750%
Incandescent Pedestrian	91.750%	87.625%

Notice in Table 6 that the “Incandescent Pedestrian” operating factor is equivalent to the sum of the LED pedestrian “Walk” and “Don’t Walk” factors since the same pedestrian signal is used for both cycles under the incandescent scenario.

After developing operating factors, energy savings were calculated for both protected and permissive intersections using Equation 1. Savings for all intersections were then summed to generate gross evaluation energy savings.

Peak demand savings were calculated using a different methodology than that employed in the M&V analysis. The M&V analysis aimed to find the hypothetical instantaneous peak demand savings at every intersection. These demand savings were then summed to generate gross demand savings. In practice, not all 95 retrofit intersections simultaneously hit their peak demand. Some will operate with high demand combinations while others operate with low demand combinations at any given instant. When all 95 intersections are considered concurrently, the actual peak demand savings are likely to approximate the mean demand savings, which is simply the annual energy savings divided by 8,760 hours. For the purposes of the evaluation, demand savings were calculated using this simplified methodology.

7.0 Conclusions

Evaluated annual energy savings were 107.0% of the tracking estimate and evaluated peak demand savings were 107.6% of the tracking estimate. Remember that these realization rates were calculated with reference to the tracking (PDA) savings, not NSPI’s M&V savings discussed in Section 4.0. In general, the tracking analysis was conducted using an approach similar to the M&V analysis, although the operational logic of the traffic signals in the tracking analysis was worse. The discrepancy between evaluated and tracking savings almost assuredly resulted from the differing operating factors used in the analyses. In general, the operating factors used in the evaluation analyses were more heavily weighted towards red lights than in the tracking analysis. Since red lights are the lowest wattage LED fixtures, they result in the greatest savings relative to the baseline incandescent fixtures which draw an equal wattage regardless of color.

Appendix B Additional Tables

Participant Satisfaction with Program Aspects

Program Aspect	2008 Respondents						2009 Respondents						2010 Respondents					
	n	Rating: 5= 'very satisfied' and 1 = 'not at all satisfied'					n	Rating: 5= 'very satisfied' and 1 = 'not at all satisfied'					n	Rating: 5= 'very satisfied' and 1 = 'not at all satisfied'				
		5	4	3	2	1		5	4	3	2	1		5	4	3	2	1
Program overall	11	64%	27	9	--	--	13	54%	46	--	--	--	13	54%	23	23	--	--
Interaction and communication with program staff	11	73%	9	9	--	9	12	75%	25	--	--	--	13	39%	8	39	15	--
Availability of program staff	11	82%	9	9	--	--	12	67%	25	8	--	--	12	33%	33	17	8	8
Interaction and communication with contractors/consultants	9	56%	44	--	--	--	12	33%	42	25	--	--	12	8%	25	50	17	--
Initial confirmation of eligibility	11	55%	45	--	--	--	13	69%	23	8	--	--	12	33%	33	17	17	--
List of available consultants	6	67%	17	17	--	--	5	20%	60	20	--	--	11	36%	9	36	--	18
Preliminary energy audit/scoping study	6	67%	17	17	--	--	9	22%	68	11	--	--	12	17%	42	25	8	8
Preliminary energy audit/scoping study rebate amount	9	56%	33	--	11	--	11	36%	55	9	--	--	12	50%	33	8	8	--
Feasibility study/assessment	7	86%	14	--	--	--	12	42%	42	18	--	--	13	31%	39	23	8	--
Feasibility study/assessment incentive amount	7	86%	14	--	--	--	12	58%	42	--	--	--	12	58%	25	8	8	--
Project implementation	8	63%	13	25	--	--	10	50%	40	10	--	--	12	33%	33	17	17	--
Project rebate amount	10	50%	40	--	10	--	10	70%	30	--	--	--	13	46%	31	15	8	--
Verification	7	57%	29	14	--	--	9	56%	22	11	--	11	12	42%	33	17	8	--

Table B-1: Importance of Energy

Participants	n	2008 Respondents					n	2009 Respondents					n	2010 Respondents				
		Rating: 5= ‘very important’ and 1 = ‘not at all important’						Rating: 5= ‘very important’ and 1 = ‘not at all important’						Rating: 5= ‘very important’ and 1 = ‘not at all important’				
		5	4	3	2	1		5	4	3	2	1		5	4	3	2	1
Reducing energy usage	11	73%	27	--	--	--	13	69%	23	8	--	--	13	69%	23	8	--	--
Managing energy costs	11	82%	18	--	--	--	13	54%	38	8	--	--	13	69%	23	8	--	--

Appendix C Interview Guides

PARTICIPANT QUESTIONNAIRE: C&I Custom Program

Final: July 22, 2010

Hello, my name is _____ from NMR Group. I am calling on behalf of Nova Scotia Power, as part of an evaluation study of their energy efficiency programs. Our records indicate that you or your firm recently participated in Nova Scotia Power's Commercial and Industrial Custom Program. We would appreciate twenty minutes of your time to answer some questions related to your participation in this program, the information you provide will be used to help Nova Scotia Power evaluate and improve the program. The survey will take about fifteen minutes. Is this a good time for you?

1. Our records indicate that your company / organization participated in Nova Scotia Power's Commercial and Industrial Custom Program. Is this correct?
 1. Yes (Go to Q3)
 2. No
2. Is there someone else at your company / organization who would know about your company / organization's participation in Nova Scotia Power's Commercial and Industrial Custom Program?
 1. Yes (Ask for name: _____ and telephone #: _____) (Thank and terminate. Schedule interview with best contact.)
 - 2.
 3. No (Thank and terminate)
3. Are you the person in your company / organization who is most knowledgeable about your experience with the Commercial and Industrial Custom Program?
___ Yes (If YES go to Q5)
___ No
4. We would like to talk to the person who is the most knowledgeable about your experience with the Commercial and Industrial 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 I. Reasons for participating

5. Did your company / organization participate in any Nova Scotia Power energy efficiency programs before the Commercial and Industrial Custom Program?
- Yes
- No (Go to Q8)
6. (If 4 = YES) Which programs did your company / organization participate in prior to the Commercial and Industrial 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
7. **(REPEAT FOR EACH PROGRAM IDENTIFIED IN Q6)** In what year did your company / organization participate in [Program x]?
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
99. Don't Know
8. How did you first learn about the Commercial and Industrial Custom Program? [RANDOMIZE AND READ 1-7, THEN 8] **(choose one) KEEP RESPONSE 3&4 TOGETHER AND IN SEQUENCE.**
1. From Nova Scotia Power literature
2. From Nova Scotia Power presentation
3. From Nova Scotia Power account manager
4. From another Nova Scotia Power staff person
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 Commercial and Industrial Custom Program
8. Or some other way? (Please Specify: _____)
9. Don't know
9. What was the ONE most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)
10. What was the second most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)

Section II. Verify Actions Recorded in Tracking Database, Free-ridership & Spillover

11. According to our records, your company / organization performed the following actions through the program. [list of actions / energy efficiency measures].
1. Do you recall conducting the feasibility study at your facility?
 1. Yes
 2. No
 9. Don't know/Don't recall
 2. Do you recall implementing or pursuing [measure 1]?
 1. Yes
 2. No
 9. Don't know/Don't recall
 3. Do you recall implementing or pursuing [measure 2]?
 1. Yes
 2. No
 9. Don't know/Don't recall
 - x. Do you recall implementing or pursuing [measure x]?

1. Yes
2. No
9. Don't know/Don't recall

12. 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 Commercial and Industrial Custom Program?

1. Outside design professional
2. Contractor
3. Manufacturer representative
4. Utility account manager
5. Someone within your company / organization
9. Don't know/Don't recall

(ASK QUESTIONS Q13 – Q15 FOR THE FEASIBILITY STUDY AND EACH MEASURE RECALLED.)

[NOTE: Two-thirds of respondents installed lighting measures—which we will ask about in general. So there will be a single iteration of these questions for them.]

13. What ONE factor was the most important in motivating your company / organization to implement or pursue [measure x]? **(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)
10. (Recommended by contractor)
11. (Past participation in utility programs)
12. (Other (Please explain _____))
99. (Don't know/Don't recall)

14. What factor was the second most important in motivating your company / organization to implement or pursue [measure x]? **(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)
10. (Recommended by contractor)
11. (Past participation in utility programs)
12. (Other (Please explain _____))
99. (Don't know/Don't recall)

AFTER ASKING ABOUT THE FEASIBILITY STUDY AND THE FIRST MEASURE, ASK Q15.

15. [IF MORE THAN ONE MEASURE WAS INSTALLED]: Were the factors motivating you to implement or pursue the other measures any different?

1. Yes (Repeat Q13-Q14 for each measure)
2. No (Continue)

IF THEY SAY YES, REPEAT Q 13-14 FOR EACH MEASURE AND DO NOT ASK Q15 AGAIN. ASKING Q15 ONCE IS SUFFICIENT.

FREE-RIDERSHIP

[ASK EACH QUESTION FR1 - FR FOR THE FEASIBILITY STUDY AND EACH MEASURE RECALLED]

- FR1. Did your company / organization have any specific plans to pursue [measure x] prior to talking with anyone about the Commercial and Industrial Custom Program?

1. Measures	2. Had specific plans to pursue measure prior to talking with anyone about the Commercial and Industrial Custom Program
3. Measure 1	4. 1. Yes 5. 2. No 6. 9. Don't know / Don't recall
7. Measure 2	8. 1. Yes 9. 2. No 10. 9. Don't know / Don't recall
11. Measure x	12. 1. Yes 13. 2. No 14. 9. Don't know / Don't recall

Now I would like to ask you to consider what actions you would have taken in the absence of the Commercial and Industrial Custom Program. If your company / organization had not participated in the

Commercial and Industrial Custom Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have... **[For FR2a-d 1 = YES, 2 = NO, 9 = Don't know; For FR2c if YES ask FR2ci]**

FR2a. Postponed installing energy efficient equipment by more than one year

FR2b. Would not have installed any energy efficient equipment

FR2c. Would have installed less energy efficiency equipment

FR2ci. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) less energy efficient lighting?]

FR2d. Would have installed the same amount of energy efficient equipment that was installed through the program

FR3. Nova Scotia Power paid [\$XX READY FROM SAMPLE FILE] of the [\$XX – READ FROM SAMPLE FILE] total project cost. If your company had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the project, including the incentive? Again, the full cost of the project would have been **[\$XX READ FROM SAMPLE FILE]**.

1. Yes
2. No
3. (Don't know)

FR4. How influential were the following elements to your decision to participate in the Commercial and Industrial Custom Program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program “had no influence at all on your decision to participate in the program” and 5 indicates that the program was “extremely influential to your decision to participate in the program.” How influential was the:

Element (READ)	(a) Performance of Measure					
a. NSPI Incentive	1 no influence	2	3	4	5 extremely influential	9 DK
b. Installation contractor	1 no influence	2	3	4	5 extremely influential	9 DK
c. NSPI Representative	1 no influence	2	3	4	5 extremely influential	9 DK
d. NSPI funded preliminary energy audit/scoping study	1 no influence	2	3	4	5 extremely influential	9 DK
d. NSPI-funded feasibility study	1 no influence	2	3	4	5 extremely influential	9 DK

SPILLOVER

[ASK Q16-Q17 FOR EACH MEASURE RECALLED IN Q11, EXCEPT FEASIBILITY STUDY]

16. Now I'd like you to think of the time since you participated in the Commercial and Industrial Custom program. Has your company purchased and installed any of [measure x] on your own for this or other facilities served by Nova Scotia Power?

1. Yes
2. No
3. Don't know [IF Q16 = NO / DON'T KNOW FOR EVERY MEASURE GO TO Q20]

17. [IF Q27=YES] Was this equipment of the same level or a higher level of efficiency as the equipment you installed or pursued through the Commercial and Industrial Custom program?
1. Yes
 2. No
 3. Don't know [IF Q17 = NO / DON'T KNOW FOR EVERY MEASURE GO TO Q20]

Measures	Q16. Purchased and installed any of measure on your own for this or other facilities served by Nova Scotia Power?	IF Q16=YES: Q17. Was equipment of the same level or a higher level of efficiency as the equipment installed through the Commercial and Industrial Custom program?
Measure 1	1. Yes 2. No 9. Don't know	1. Yes 2. No 9. Don't know
Measure 2	1. Yes 2. No 9. Don't know	1. Yes 2. No 9. Don't know
Measure x	1. Yes 2. No 9. Don't know	1. Yes 2. No 9. Don't know

[IF Q17=YES, ASK Q18-19]

18. About how much of the energy efficient [measure x] did your company / organization purchase on its own since participating in this program? Please give your response as a percentage of the amount of [measure x] installed or pursued through the program? ____% (Don't know=999)
 ALLOW 1-998—THEY COULD HAVE INSTALLED MORE THAN WAS INSTALLED THROUGH THE PROGRAM.

19. Did your experience with the energy-efficient equipment installed or pursued through the Commercial and Industrial Custom program influence your decision to install some or all this energy efficient [measure x] on your own?

1. Yes 2. No 9. Don't know/Don't recall

Measures	Q18. Quantity of measure purchased on its own as percentage of amount installed through the program.	Q19. Was decision to install additional equipment influenced by experience with Commercial and Industrial Custom program?
Measure 1	_____%	1. Yes 2. No 9. Don't know
Measure 2	_____%	1. Yes 2. No 9. Don't know
Measure x	_____%	1. Yes 2. No 9. Don't know

20. Has your participation in the Commercial and Industrial Custom Program influenced other energy efficiency actions that your company / organization has taken?

1. Yes. We have implemented additional energy efficiency measures.
2. Yes. We have pursued additional scoping, feasibility or technical assessment studies.
3. No. We have not pursued additional measures or scoping, feasibility or technical assessment studies. (Go to Q22)
9. Don't know/Don't recall (Go to Q33)

21. (If Q20 = 1 or 2) What other measures has your company / organization implemented or are currently being pursued? (1=Have implemented; 2=Currently pursuing; 3=Not implemented/pursuing; 9=DK/Ref)

1. Scoping, feasibility or technical assessments
2. Motors and drives
3. AC
4. Heating
5. Ventilation
6. Insulation
7. Windows
8. Energy management system or controls
9. Behavior changes (e.g. thermostat)
10. Air Compression
11. Refrigeration
12. (if industrial) Industrial processes
13. Other (Specify: _____)
99. Don't know/Don't recall

IMPLEMENTED MEASURES

Q21A1. FOR EACH Q21=1 (except scoping, feasibility or technical assessments): Did you implement this energy efficient upgrade through a Nova Scotia Power energy efficiency program? That is, did you or do you expect to receive a rebate from Nova Scotia Power or the New Efficiency Nova Scotia Power Corporation for implementing the energy efficient upgrade?

1. Yes -- ASK ABOUT NEXT MEASURE IN Q21=1
2. No -- CONTINUE TO Q21A2
3. (Don't know / not sure) -- ASK ABOUT NEXT MEASURE IN Q21=1
4. (Refused) -- ASK ABOUT NEXT MEASURE IN Q21=1

(WHEN ALL MEASURES WHERE Q21=1 HAVE BEEN COVERED IN Q21A SERIES GO TO Q21B SERIES)

IF Q21A1 = 2:

Q21A2. Why not? [Record verbatim]

Q21A3. When did you implement this energy efficient upgrade? (Record Month), 2010

Q21A4. Approximately, how many kilowatt hours of electricity do you expect you will save IN 2010 as a result of implementing this energy efficient upgrade? Keep in mind that these savings could be from EARLY replacements or changes to existing, less efficient measures and processes; or the savings could be from PLANNED OR END-OF-LIFE replacements and installations of higher efficiency rather than standard efficiency measures and processes.

(IF RESPONDENT CANNOT GIVE A kWh ESTIMATE, ASK FOR ESTIMATE OF SAVINGS ON BILL. IF RESPONDENT CANNOT GIVE A SINGLE NUMBER, OBTAIN A RANGE. 99999=Don't know;)

2010 Savings: _____ kWh OR \$ _____

(88888=Measure uses fuel other than electricity: What fuel is that? _____)

IF NON-ELECTRIC FUEL (88888) SKIP TO NEXT MEASURE IN Q21=1.)

Q21A5. (IF Q21A4 $\neq$ 88888): And how many kilowatt hours of electricity do you expect to save from using this energy efficient measure or process over one full calendar year?

(IF RESPONDENT CANNOT GIVE A kWh ESTIMATE, ASK FOR ESTIMATE OF SAVINGS ON BILL. IF RESPONDENT CANNOT GIVE A SINGLE NUMBER, OBTAIN A RANGE.

99999=Don't know.)

Full Calendar Year Savings: _____ kWh OR
\$ _____

WHEN ALL MEASURES WHERE Q21=1 HAVE BEEN COVERED IN Q21A SERIES CONTINUE TO Q21B SERIES.

CURRENTLY PURSUING MEASURES

Q21B1.FOR EACH Q21=2 (except scoping, feasibility or technical assessments):

Do you plan on implementing this energy efficient upgrade through a Nova Scotia Power energy efficiency program? That is, do you expect that you will receive a rebate from Nova Scotia Power or the New Efficiency Nova Scotia Power Corporation for implementing the energy efficient upgrade?

1. Yes -- ASK ABOUT NEXT MEASURE IN Q21=2
2. No -- CONTINUE TO Q21B2
3. (Don't know / not sure) -- ASK ABOUT NEXT MEASURE IN Q21=2
4. (Refused) -- ASK ABOUT NEXT MEASURE IN Q21=2

(WHEN ALL MEASURES WHERE Q21=2 HAVE BEEN COVERED BY Q21B SERIES, GO TO SECTION III, Q22)

IF Q21B1 = 2:

Q21B2. Why not? [Record verbatim]

Q21B3. When do you expect to have [energy efficient upgrade from Q21=2] implemented?

1. 2011
2. 2012
3. 2013
4. 2014 or later
5. (Don't know / not sure)

6. (Refused)

Q21B4. Approximately, how many kilowatt hours of electricity do you expect you will save in [YEAR FROM Q21B3] as a result of implementing this energy efficient upgrade? Keep in mind that these savings could be from EARLY replacements or changes to existing, less efficient measures and processes; or the savings could be from PLANNED OR END-OF-LIFE replacements and installations of higher efficiency rather than standard efficiency measures and processes.

(IF RESPONDENT CANNOT GIVE A kWh ESTIMATE, ASK FOR ESTIMATE OF SAVINGS ON BILL. IF RESPONDENT CANNOT GIVE A SINGLE NUMBER, OBTAIN A RANGE. 99999=Don't know.)

[YEAR FROM Q21B3] Savings: _____ kWh OR
\$ _____

(88888=Measure uses fuel other than electricity: What fuel is that? _____)

IF NON-ELECTRIC FUEL (88888) SKIP TO NEXT MEASURE IN Q21=2.)

Q21B5. (IF Q21B4 $\neq$ 88888): And how many kilowatt hours of electricity do you expect to save from using this energy efficient measure or process over one full calendar year?

(IF RESPONDENT CANNOT GIVE A kWh ESTIMATE, ASK FOR ESTIMATE OF SAVINGS ON BILL. IF RESPONDENT CANNOT GIVE A SINGLE NUMBER, OBTAIN A RANGE.

99999=Don't know.)

Full Calendar Year Savings: _____ kWh OR
\$ _____

WHEN ALL MEASURES WHERE Q21=2 HAVE BEEN COVERED IN Q21B SERIES CONTINUE TO SECTION III, Q22.

Section III. Satisfaction with Program & Recommendations for Improvements

22. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', how was your company / organization's experience with each aspect of the Commercial and Industrial Custom Program.

If your company / organization did not have experience with one of the aspects please tell me.
[DO NOT RANDOMIZE] [7 = Not Applicable, 9 = Don't know/Don't recall].

1. Interaction and communication with staff
 2. Availability of staff
 3. Interaction and communication with contractors/consultants
 4. Initial confirmation of eligibility
 5. List of available consultants
 6. Preliminary Energy Audit/Scoping Study
 7. Preliminary Energy Audit/Scoping Study rebate amount
 8. Feasibility Study/Assessment
 9. Feasibility Study/Assessment incentive amount
 10. Project Implementation
 11. Project rebate amount
 12. Verification
 13. The program overall
23. On a scale of 1 to 5, where 1='not at all satisfied' and 5='very satisfied', please rate your company / organization's experience with the application, rebate/incentive and associated paperwork. [9 = Don't know/Don't recall]
-

Section IV. Barriers to Action & Recommendations for Improvements

24. Were there any challenges or barriers that you faced in implementing these energy efficiency measures?
1. Yes
 2. No (SKIP TO Q30)
 9. Don't know/Don't recall
25. What was the ONE 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)
 12. (Other (Specify: _____))
 99. Don't know/Don't recall
26. 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)
 12. ____ (Other (Specify: _____))
 99. ____ (Don't know/Don't recall)
27. 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? [9=Don't know/Don't recall]

28. 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? [9=Don't know/Don't recall]

29. What percent of your annual operating budget do energy costs account for? [999=Don't know/Don't recall] ____%
30. Do you have any suggestions on how to improve the Commercial and Industrial Custom Program? Consider all aspects of the program: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms.
- _____
- _____
- _____
- _____
- _____
- _____

Section V. Firmographics

31. What is the principal 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.) NOT IN CBECS)
16. Other
17. Vacant
99. Don't know/Don't recall

32. Into which of the following categories does your building floor space fall?
(square meters) (square feet)

1. 93 or less	1,000 or less
2. 93 – 463	1,000-4,999
3. 465-929	5,000-9,999
4. 930-4645	10,000-49,999
5. 4,646-9,290	50,000-99,999
6. Over 9,290	Over 100,000
99. Don't know/Don't Recall	

33. 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
9. Don't know/Don't recall

34. How many hours per week, on average, is the facility open? [999 = Don't know/Don't recall]

—

35. Is your company independent, or part of a larger company?

1. Independent
2. Part of a larger company
3. Don't know
4. Refused
5. Other (_____)
9. Don't know/Don't recall

Staff Interview Guide for NSPI, July 2010**Date:****Name:****Programs responsible for:****Introduction:****[This interview should take about an hour]**

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:**We'd like to start by confirming a few things about your role with the program:**

1. Last year you told us that you spent about 90-95% of your time on the C&I program. Is this still the case?
2. Other than the program staff you identified in our last conversation, 1 engineer in training and 2.5 COOP engineering students, are there any other NSPI staff members who interact with program?
3. Aside from program contractors, do you interact with anyone else regarding the program? How frequently and regarding what aspects of the program?
 - a. [Probe: Last year you indicated that Conserve Nova Scotia was also working on developing a C&I Custom program. Since CNS is phasing out electric efforts are they continuing with a C&I gas program? If so, do you interact with this program?]
4. What is the period of the program? When did it start? When will it end?
5. What are the 2010 energy savings goals for this program? Do you think you will achieve these goals?

Program Revisions and Changes:

6. We'll be going into a number of specific areas later in the interview, but from an overall perspective, what would you say are the successes you were able to achieve in planning and implementing the program this year?
 - a. Again at the broadest level, what were the areas that were not so successful?
 - b. To what do you trace the difficulties you encountered? How might they be addressed in future programs?
7. Since last year there have been a few changes to the C&I program
 - i. Assignment of an NSPI project owner, who manages projects cradle to grave
 - ii. Improved lighting savings calculation tool
 - iii. Simplified feasibility studies for lighting
 - iv. Improved data tracking system

- v. Increased flexibility on financing (up to five years)
 - vi. Increased incentive levels (above \$0.15 / kWh)
 - 1. Why was the decision made to increase the incentive level?
 - 2. [Probe: last year we recommended that NSPI meet with energy efficiency contractors to receive feedback regarding the methodology of the incentive calculations? Did this happen?]
 - vii. Have there been any other changes to the program?
8. How successful has the simplified feasibility study for lighting been? Why? [Probe: What has been the reaction from contractors?] [This was one of our recommendations last year]

Theory and Logic Model Review:

- 9. Is the program theory and logic model included in the C&I program manual still valid?
- 10. Has the program been expanded to include participants other than larger commercial, industrial and municipal customers?
- 11. What other outreach or marketing activities has the program engaged in?
- 12. In general, how would you characterize the overall goals of the program—would you say that the program is primarily a Resource Acquisition program, where the focus is on delaying or displacing new power plant construction through demand reduction? Or would you say the program is primarily a Market Transformation program, where the focus is on changing practices and building adoption, and ultimately effect changes in NS provincial energy standards? Or is it a combination of the two? Why?
- 13. What are the short-term goals of the retail markdown program? [Probe: Try to think about goals other than the energy savings]
 - a. [Probe: Are there any goals or outcomes that are not included in the logic model?]
 - b. How do you think this program will affect the overall market in the short term? What is the mechanism by which this impact on the market will be achieved?
 - c. Probe: The theory and logic model in C&I program manual identified
 - i. Immediate kW/kWh savings
 - ii. End users and trade allies use C&I as a tool to justify or prove that savings will be there
 - iii. Increasing number of end-users, contractors and/or energy services providers participating in C&I
- 14. What are the intermediate goals of the program?
 - a. [Probe: Are there any goals or outcomes that are not included in the C&I logic model?]
 - d. How do you think this program will affect the overall market in the intermediate term? What is the mechanism by which this impact on the market will be achieved?

- b. [Probe: The theory and logic model identify
 - i. Persistent KW and kWh savings
 - ii. Increased acceptance of new technologies in the marketplace
 - iii. C&I participants benefit economically from their projects
15. What are the long-term goals of the program?
- a. [Probe: Are there any goals or outcomes that we have not included in the logic model?]
 - e. How do you think this program will affect the overall market in the long term? What is the mechanism by which this impact on the market will be achieved?
 - b. [Probe: The theory and logic model identify
 - i. End-users undertake more energy efficiency projects independently
 - ii. An increasingly robust energy efficiency services industry exists in Nova Scotia
 - iii. Permanent improvement in standard equipment specifications
 - iv. kW and kWh savings from non-program projects
 - v. NSPI Integrated Resource Plan goals achieved
16. How do you expect to measure the extent to which program goals have been accomplished—that is, what are the indicators for the outcomes you expect to achieve? Short-term? Intermediate? Long-term?
- a. Are there any key indicators or metrics to gauge program effectiveness and success in short-, intermediate-, and long-term?

Marketing, Participating Retailers, and Verification:

17. Please explain the various marketing activities utilized by each program. What do you think is particularly good about program marketing? How could program marketing be improved?
- a. When marketing the program to customers do you focus on the financial benefits of the program? [Recommendation from last year]
18. What trade allies have been identified for the program?
- a. What, if any, activities have been undertaken to develop trade allies to act as the primary sales force for the program? [Probe: Last year we recommended that NSPI conduct training sessions with energy efficiency contractors that will educate them on the C&I program and work with them to develop marketing tools that they can utilize with customers. Training contractors will serve as a strong marketing component of the C&I program, helping to reach those customers who are currently unaware of the program.]
19. Overall, how successful has the C&I program been so far? Why / Why not?
20. What do you think is particularly good about program delivery? How could program delivery be improved?

21. For the C&I program, how has the involvement of contractors changed since last year? [Probe: Have contractors taken a more active role in program marketing?] **[Probe: in the program logic model NSPI has identified that trade allies and other firms will act as the primary sales force for the program.]**
 - a. Do you think the current level of involvement by contractors is sufficient? How could contractors become more invested in the program?
22. Are there any barriers to contractors / trade allies participating in the program? What are the motivations for contractor / trade ally participation? [Probe: Last year contractors indicated that having a second opinion from NSPI was beneficial in selling energy efficiency to customers.]
23. What have been the impacts of the programs on energy efficiency activities in C&I customers in Nova Scotia? What are the most obvious signs?
24. Have you made any efforts to target specific customers? Are there any customer categories that you have had trouble reaching with the program?
25. How does the C&I program interact with the SBLS program, if at all?
26. Are there any gaps in coverage—segments, technologies, or anything else you can think of—that are covered neither by the NSPI programs or any other programs? What could be done to address those gaps?

TIME PERMITTING: Review of 2008 Recommendations:

27. I am going to review some of the evaluation recommendations from 2008. For each one, please indicate whether the recommendation was considered or adopted? And, if not, why not? [SEE NEXT PAGE FOR RECOMMENDATIONS]

Strengths and Weaknesses / Wrap-up:

28. What would you say are the programs greatest strengths? And what would you say are the programs greatest weaknesses? What could be done to address these weaknesses?
29. Based on your experience with the program so far, what are the most important improvements that still need to be made to the program?
30. Are there any other program issues we have not discussed that you would like to mention?

Thank You

Participant Interview Guide: NSPI C&I BER – Free-ridership and Spillover**Interviewer:****Date of Interview:****Respondent Name:****Title:****Phone Number:**

Hello, my name is _____ from NMR Group, Inc. and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm has performed work for a Nova Scotia Power customer who has participated in the Commercial and Industrial Custom and the Business Energy Rebate programs offered by Nova Scotia Power. As part of our evaluation we would like to ask you a few questions about your interactions with both programs and any additional energy efficiency upgrades your company has made without assistance from Nova Scotia Power. These questions should take about 20 – 30 minutes. Please be aware that the information you provide will be treated as confidential.

With your permission, I would like to record the interview. We will use the recording for transcription purposes in order to make sure we accurately represent your responses. No one but NMR staff members will listen to the recording. NMR will keep all recordings in its files. Do I have your permission to record the interview ____ Yes ____ No

Background and interaction with staff

1. Are you the person at [company] who is most knowledgeable about your experiences with energy efficient equipment or upgrades rebated by Nova Scotia Power?
2. What is your job title? What roles and responsibilities do you have at [company]? Is your area of responsibility limited to areas served by Nova Scotia Power or does it extend outside of Nova Scotia Power's service territory? [If knowledge not limited to Nova Scotia] - Please limit your responses to facilities served by Nova Scotia Power.
3. It is our understanding that [company] operates a variety of businesses in Nova Scotia including: **[businesses]**. Is this correct? Which of these businesses do you have responsibility for? During this interview, we would like you to consider all of the businesses throughout Nova Scotia.
4. In 2010, which of NSPI rebate programs have you worked with? (PROBE: Commercial and Industrial Custom Program (C&I Custom), Business Energy Rebate (BER), Small Business Lighting Solutions Program (SBLS), Small Business Direct Install Program (DI)).
 - a. For each program, when did you participate in the program? For which stores and about how many store locations did you participate in the program?
 - b. How about prior to 2010—which NSPI rebate programs have you participated in prior to 2010?

5. In general, how often do you interact with NSPI energy efficiency program staff? Who do you interact with at NSPI?
 - a. What types of interactions do you typically have with NSPI staff? [Probe: status calls, meetings, etc.] Could these interactions be improved? How so?
6. Some companies work with a design professional, project architect, engineer, equipment contractor or a utility account manager as part of the project design process. I realize that your needs may vary by project but have you used such professionals in the past during project scoping or design?
 - a. [If Yes] – In general, who do you feel is most responsible for specifying the measures to install through the C&I Custom program?
 - b. [If Yes] – In general, who do you feel is most responsible for specifying the measures to install through the BER program?

Program delivery process

The C&I Custom program follows a four-step process: Preliminary Energy Audit/Scoping Study, Feasibility Assessment, Project Implementation and Verification.

7. Which of these steps have you participated in?
 - a. Preliminary audit/scoping study?
 - b. Feasibility assessment?
 - c. Project implementation?
 - d. Verification?
8. In general, are there parts of the program process that you think work well? Are there parts you think do not work well? [Probe: four-steps listed above]
 - a. Are there any processes required by NSPI that you feel are particularly onerous or that pose a barrier to participation in the C&I Custom program? [Probes: Assistance, availability, or interaction with program staff; requirements of any of the four-steps;]

The BER program was designed to streamline the rebate process for C&I Customers implementing five categories of measures: lighting, motors & variable speed drives, refrigeration, compressed air equipment and Heating and Cooling (HVAC) products. In general, measures implemented through the BER program are simpler in nature compared to the C&I Custom program.

9. Which measures have you implemented through the BER program?
 - a. Lighting
 - b. Motors

- c. Refrigeration
 - d. Compressed air
 - e. HVAC
10. Based on your experience with the BER so far, are there parts of the program process that you think work well? Are there parts you think do not work well? [Probe: paperwork, time consuming, etc.]
- a. Are there any processes required by NSPI that you feel are particularly onerous or that pose a barrier to participation in the BER program? [Probes: Assistance, availability, or interaction with program staff;]

Motivations, barriers and gaps

11. What single factor was the most important in motivating your company to install energy efficient equipment or upgrades rebated by NSPI? What other factors were important in motivating your company to install energy efficient equipment or upgrades?
- a. What motivates you to participate in the NSPI rebate programs? [Probe: Save energy, rebates offered, reduce maintenance costs, protect environment, recommended by utility, concerns with carbon, etc.]
12. Were there any challenges or barriers that you faced in making the decision to participate in the NSPI programs? What was the ONE most important barrier? Were there any other barriers?
- a. What barriers exist that might prevent you from participating in NSPI rebate programs for future projects? [PROBE: lack of information, incentive too small, too much work to apply, do not own building, approval takes too long, small C&I excluded etc.]
13. Were there any challenges or barriers that you faced when implementing measures rebated by NSPI? What was the ONE most important barrier? Were there any other barriers?
14. Are there any issues or concerns that you have encountered while participating in NSPI rebate programs? How were these issues or concerns addressed? How could they be addressed in the future?
15. Are there currently any energy efficient measures, upgrades or actions that are not covered by any NSPI programs? That is, are there any gaps in the energy efficiency programs offered by NSPI?

Satisfaction

16. On a scale of 1 to 5, where 1 = 'not at all satisfied' and 5 = 'very satisfied', how was your company's experience with each of the following?
- a. C&I Custom Program Overall
 - b. BER Program Overall

- c. SBLS Program Overall
- d. Interaction and communication with NSPI staff **[Does this vary by program at all?]**
- e. Project implementation
- f. Rebate amounts **[Does this vary by program at all?]**
- g. Measurement and verification
- h. Application, rebate/incentive and associated paperwork **[Does this vary by program at all?]**

Free-ridership [ASK once for C&I and once for BER]

Now I'd like to ask you a few questions about the energy efficiency improvements that you implemented with assistance from NSPI rebate programs.

17. Did your company have any specific plans to install any energy efficient equipment or upgrades prior to talking with anyone about the NSPI rebate programs?

Now I would like to ask you to consider what actions you would have taken in the absence of the NSPI rebate programs. If your company / organization had not participated in these rebate programs, which of the following actions do you think you would have taken? Please select all that apply. Would you have...

18. Postponed installing energy efficient equipment by more than one year
19. Would not have installed any energy efficient equipment
20. Would have installed less energy efficiency equipment
- a. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) less energy efficient equipment?]
21. Would have installed the same amount of energy efficient equipment that was installed through the program
22. If you had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the energy efficient upgrades including the incentive?
23. How influential were the following elements to your decision to participate in the NSPI rebate programs? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to participate in the program" and 5 indicates that the program was "extremely influential to your decision to participate in the program." How influential was the:

Element (READ)						
a. NSPI Incentives or rebates	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information or advice received from the program	1 no influence	2	3	4	5 extremely influential	9 DK
c. Information, advice, or services provided by a contractor	1 no influence	2	3	4	5 extremely influential	9 DK
d. NSPI Representative	1 no influence	2	3	4	5 extremely influential	9 DK

Spillover

Now I'd like you to think about any energy efficient equipment or upgrades that your company is currently pursuing or has installed in the past two years on its own. These measures could include the same type of measures installed through rebate programs or measures not covered by NSPI rebate programs.

24. Is your company currently pursuing or has it purchased and installed any energy efficient equipment or upgrades on your own at any facilities served by Nova Scotia Power.
 - a. What other measures has your company implemented or is currently pursuing?
25. In general, is this equipment of the same level or a higher level of efficiency as the equipment you installed or pursued through the NSPI rebate programs?
26. Where was or will this equipment be installed? (PROBE: Other locations?)
27. Did you, or do you plan to implement these energy efficient upgrades through a Nova Scotia Power energy efficiency program? That is, did you or do you expect to receive a rebate from Nova Scotia Power or the New Efficiency Nova Scotia Power Corporation for implementing these energy efficient upgrades?
 - a. Why not?
 - b. When do you plan to implement these energy efficient upgrades? – SKIP TO Q30
28. Approximately, how many kilowatt hours of electricity do you expect you will save IN 2010 as a result of implementing these energy efficient upgrades? Keep in mind that these savings could be from EARLY replacements or changes to existing, less efficient measures and processes; or the

savings could be from PLANNED OR END-OF-LIFE replacements and installations of higher efficiency rather than standard efficiency measures and processes.

- a. And how many kilowatt hours of electricity do you expect to save from using these energy efficient measures or processes over one full calendar year?

29. How influential was your participation in the C&I Custom or BER program to your decision to implement or pursue these additional energy efficiency actions or measures? Please give your answer on a scale of 1 to 5, where 1 indicates that the programs were “no influence at all” and 5 indicates that the programs were “extremely influential.”

Measure Descrips	Efficiency Level	Implement through NSPI	Why not?	Date Implement	kWh 2010	Annual kWh	Influence

Recommendations for improvements

30. 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? [9=Don't know/Don't recall]

—

31. 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? [9=Don't know/Don't recall]

—

32. What percent of your annual operating budget do energy costs account for? [999=Don't know/Don't recall] ___%

33. Do you have any suggestions on how to improve any of the NSPI rebate programs? Consider all of the programs which you have experience with and all aspects of these programs. [PROBE: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms.]



Impact and Process Evaluation: Small Business Direct Install Program 2010

February 25, 2011

Final Report

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Efficiency Nova Scotia Corporation

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Executive Summary

This report presents the results of the 2010 process and impact evaluations of the Small Business Lighting Solutions Program (SBLS) conducted by NMR Group, Inc. (NMR). NMR conducted this evaluation for Nova Scotia Power and Efficiency Nova Scotia Corporation. Nova Scotia Power was the interim DSM Administrator until October 1, 2010. Hereafter, this report uses the term "DSM Administrator" when referring to either Nova Scotia Power or Efficiency Nova Scotia Corporation. Throughout this report, the results of the 2008 and 2009 evaluations of the SBLS program are presented alongside the 2010 results and contrasted where appropriate. For the 2010 program year, the DSM Administrator contracted with three competitively selected service providers, termed "Delivery Agents," to provide audit and installation services, a single materials provider, termed "Materials Vendor," and a single recycler, termed 'Recycling Contractor.' The 2010 process evaluation was based on in-depth interviews with the DSM Administrator's staff, Delivery Agents, the Materials Vendor and the Recycling Contractor as well as a telephone survey of 65 program participants.

Impact Evaluation Findings

The impact evaluation draws upon a review of program records and results from the 2008 evaluation. The telephone surveys of participants were used to estimate free-ridership and spillover. The NMR team estimated that the net generator-level impacts from 2010 SBLS program were 11,210 MWh of energy savings and 1,529.5kW of demand savings.. These savings fell short of the energy savings goal of 13,980 MWh and the demand savings goal of 3,300 kW.

Table 1: 2010 Program Energy Savings

	Demand (kW)	Energy (MWh)
Gross savings at generator	1,758.5	12,944
Net-to-Gross Ratio (%)	87.0%	86.6%
Net annual savings at generator	1,529.9	11,210

Key Findings

The net energy impacts of the SBLS program have increased steadily since 2008. They have more than tripled from 1,522 MWh in 2008 to 4,701 MWh in 2009 and more than doubled again in 2010 to 11,210 MWh. The SBLS program continued to perform strongly with high levels of customer satisfaction (greater than nine out of ten respondents in 2010) and relatively low levels of free-ridership, although free-ridership increased relative to 2008 and 2009 (about 13% in 2010).

Last year, NMR recommended that the program closely monitor the performance of Delivery Agents, Electrical Contractors and the Materials Vendor to ensure that it continued to maintain high levels of customer satisfaction and installation quality. In 2010, the expansion of the program appears to have had no negative impact on customer satisfaction. The great majority of 2010 respondents (97%) reported that they were satisfied with the program overall and seven out of ten (70%) reported they were 'very satisfied.' In addition, more than eight out of ten 2010 respondents reported that they were satisfied with all aspects of the program.

Notwithstanding the high levels of customer satisfaction, issues with material orders and deliveries were mentioned by program staff, Delivery Agents, and the Materials Vendor. These issues began when the program expanded to serve the entire province and the Materials Vendor began using a more centrally located warehouse. Due to these changes, the Delivery Agents began to report problems with incorrect or late deliveries. This is an issue that occurred in the 2008 program year but was resolved for the 2009 program year. In light of the concerns of the Delivery Agents, the DSM Administrator decided to move away from a single source Materials Vendor in 2011. Under this alternate program design, instead of Delivery Agents using a sole source Materials Vendor subject to price constraints, Delivery Agents are responsible for obtaining their own materials and adhering to a maximum price constraint for work completed. This alternate program design allows Delivery Agents to choose their own source of lighting materials and allows them to competitively shop for Materials Vendors that can meet their price and customer service requirements. The NMR team believes that this approach may alleviate some concerns for Delivery Agents and allow the program to continue to grow and operate without constraints imposed by materials delivery issues. With the implementation of this alternative program design it will become increasingly important for the DSM Administrator to monitor the performance of Delivery Agents in order to achieve 2011 targets and to ensure continued high levels of customer service.

Findings and Recommendations

Finding	Recommendation
SBLS-F1. In 2010, the SBLS program formally added a Recycling Contractor responsible for collecting and recycling lamps and ballasts throughout the province. While the program had a Recycling Contractor in 2009, the process was much improved in 2010. In fact, in the 2009 evaluation, NMR recommended that, “As the SBLS program expands and begins to offer services in additional regions, the DSM Administrator should ensure that adequate recycling services are available.” In 2010, the DSM Administrator took this to heart and instead of requiring Delivery Agents to box and ship lamps from outlying areas, the Recycling Contractor was able to schedule pickups throughout the province, an improvement according to the Delivery Agents.	SBLS-R1. The SBLS program should continue to require that all materials removed during lighting retrofits be properly recycled and maintain a mechanism for accomplishing this.
SBLS-F2. Despite the expansion of the SBLS program in 2010, the program still relied heavily on word-of-mouth, contractors, vendors and DSM Administrator staff to recruit participants. When respondents to the participant survey were asked how they had first become aware of the SBLS program, more than one-half (55%) cited word of mouth (23%) or trade allies (22%)—electricians, contractors or vendors.	SBLS-R2. The DSM Administrator should consider providing participants and trade allies with ‘leave behinds’ that they can provide to interested customers. One possibility may be to provide them with SBLS business cards that contain the contact information for the Delivery Agent in their region.
SBLS-F3. Customers were motivated to participate in the program primarily to save on energy costs/bills—71% of 2010 survey respondents reported saving on energy costs/bills as their primary motivation and 18% reported saving on energy costs/bills as their secondary motivation.	SBLS-R3. The DSM Administrator should continue to promote the financial benefit of program participation to small businesses.

Findings and Recommendations

Finding	Recommendation
SBLS-F4. As in 2008, the 2010 SBLS program encountered materials delivery issues. Delivery Agents estimated that anywhere between 60% and 80% of all deliveries were late or incorrect. Despite the implementation of a ‘Customer Continuous Improvement Quality Action Plan’ by the Materials Vendor in mid-2010, the Delivery Agents reported continuing materials delivery issues during in-depth interviews in August 2010. Whether the delivery issues existed at the level reported by the Delivery Agents or had been resolved as reported by the Materials Vendor was unclear. Despite this, the DSM Administrator has implemented an alternative program design that would eliminate issues in the future. Under this alternate program design, instead of Delivery Agents using a sole source Materials Vendor subject to price constraints, Delivery Agents are responsible for obtaining their own materials and adhering to a maximum price constraint for work completed. This alternate program design allows Delivery Agents to choose their own source of lighting materials and allows them to competitively shop for Materials Vendors that can meet their price and customer service requirements.	SBLS-R4. NMR recommends that the DSM Administrator carefully monitor the implementation of the alternative program design to ensure continued high levels of customer service. The DSM Administrator should also consider developing and instituting minimum criteria for reliability and materials quality for Materials Vendors chosen by Delivery Agents.
SBLS-F5. Some respondents cited barriers to implementing additional energy efficiency measures (beyond those covered by the program) including lack of additional recommended measures (20%), lack of financing (16%), lack of information (11%) and lack of time (9%). In addition, spillover was relatively low among participants.	SBLS-R5. At the time of participant contact, the DSM Administrator should continue to provide additional information or direct customers to other sources of information for identifying other energy efficiency measures they can implement.
SBLS-F6. About one-half of the 2010 respondents (54%) said they had purchased some type of energy efficient lighting product prior to participating in the SBLS program. However, the majority of these purchases consisted of CFLs (71%) or LED exit lights (11%). In addition, while nearly two out of five respondents (37%) said they had had plans to pursue lighting improvements, their responses to a series of questions designed to estimate free-ridership indicated relatively low levels of free-ridership (13%) for the program. This indicated that, while SBLS participants were aware of lighting energy efficiency improvement opportunities, they were unlikely to take action without the assistance of the SBLS program.	SBLS-R6. The SBLS program is a crucial source of information, assistance and funding for participants. The DSM Administrator should continue to offer the SBLS program to small businesses.

Findings and Recommendations

Finding	Recommendation
SBLS-F7. While nearly all of the 2010 respondents (63 out of 65) said they would be likely to purchase energy efficient equipment when replacing equipment in the future, fewer than three in ten respondents (29%) reported that participation in the SBLS program had influenced them to take additional actions on their own. When asked why they have not pursued additional measures, nearly one-half (49%) of respondents said that they did not know of additional measures (20%), were unable to provide a reason (18%) or lacked information about additional measures (11%). In addition, nearly all of the 2010 respondents said that reducing energy usage (97%) and managing energy costs (96%) were important to their businesses.	SBLS-R7. Despite the importance of reducing and managing energy costs to participants and their receptivity to purchasing energy efficient equipment, relatively few respondents reported taking additional actions after participating in the SBLS program. The DSM Administrator should consider expanding program offerings to help small business customers identify and pursue other energy efficiency measures.

1 Program Description

1.1 Program Description

The DSM Administrator's 2010 Small Business Lighting Solutions Program (SBLS) was designed to achieve annual energy savings of 13,980 MWh and demand savings of 3,300 kW. The program offered lighting retrofits to eligible participants at 20% of the installed cost, with the DSM Administrator paying for the remaining 80% of the installed costs.

Program participation was limited to two geographical areas in 2008 and in 2009: the city of Dartmouth and Pictou County, Nova Scotia. In 2010, the program was expanded to serve the entire province, divided into six areas of service. Eligible participants were defined as small businesses with an average monthly demand of less than 100 kW and annual usage of less than 300,000 kWh. Typical qualifying small businesses included small retail, convenience and grocery stores, small offices, service stations, restaurants, lodging facilities, non-profit organizations, small government facilities and institutional and health care facilities.

In 2009, a recycling component was incorporated into the program. The recycling contractor coordinated with the Dartmouth region SBLS Delivery Agent to pick up lamps and fixtures removed from job sites. In 2010, the recycling component was retained and expanded, covering all six regions. Prior to the addition of the Recycling Vendor removed lamps were not recycled. In addition, the recycling component was improved in 2010. In 2009, Delivery Agents were required to box and ship lamps from outlying regions. In 2010, the Recycling Contractor coordinated the pickup of lamps and ballasts throughout the province.

1.1.1 Program Theory

Program Background

The objective of the SBLS program is to reach small businesses that do not have the resources to complete lighting retrofits on their own. The SBLS program is primarily a Resource Acquisition program that seeks to reduce the need for future generation by assisting small business customers with lighting retrofits. The program offers small business customers assistance that reduces the costs of installing new lighting by 80% and offers up to two-years, interest-free financing for the participants' remaining share of installation costs.

Program Activities

The program's interaction with customers generally follows the process outlined below:

- **Customer screening.** The DSM Administrator creates a list of pre-qualified customers who are eligible for the program. This helps to focus the marketing efforts only on eligible customers.
- **Outreach and marketing.** Delivery Agents contact potential participants by telephone, mail-out brochures and in-person visits. Delivery Agents explain the program to business owners and managers and obtain agreement to participate.
- **Material arrangement.** The DSM Administrator identifies and negotiates with material suppliers who will provide equipment to Delivery Agents at agreed-upon prices.
- **Lighting audits.** Delivery Agents perform on-site lighting audits of participants' facilities.

- **Audit review and recommendations.** The DSM Administrator reviews and approves audit reports and recommendations before they are presented to the participants.
- **Obtain customer authorization.** Delivery Agents review audit recommendations with customers and obtain their authorization to proceed.
- **Order and delivery of materials.** The Delivery Agents place orders with the Materials Vendor and the Materials Vendor delivers the products to the participants' sites.
- **Installations.** Delivery Agents install the products in participants' facilities.
- **Recycling.** The program materials recycler picks up and recycles removed lamps and fixtures.
- **Invoicing and customer billing.** Delivery Agents invoice the DSM Administrator who then places charges on customers' utility bills.
- **Walkthrough and final approval.** The DSM Administrator inspects a portion of the jobs completed through the program.

Program Assumptions

The following assumptions underlie the program's process:

- **Availability of materials.** The Materials Vendor has access to sufficient quantities of the lighting products needed for the lighting retrofits.
- **Skills and equipment.** The Delivery Agents have the equipment, tools and skills required to complete lighting audits and installation services or they can contract for such services.
- **Outreach and marketing.** The outreach performed by the Delivery Agents will be sufficient to generate interest among potential participants.

Program Barriers

- **Perceptions of quality.** Some small businesses are concerned that energy efficient lighting may decrease their lighting quality.
- **Sufficient labor.** Electrical contractors are in high demand in Nova Scotia. A lack of interested electrical contractors could lead to inadequate resources to perform installations.

Short-Term Outcomes

- **Generate customer interest.** Customers are made aware of the program by Delivery Agents.
- **Lighting audits are performed.** After becoming aware of the program, customers allow Delivery Agents to perform lighting audits.
- **Contract for services.** After being presented with the costs and savings estimates, customers contract with Delivery Agents to implement the lighting retrofits.

Mid-Term Outcomes

- **Energy savings and bill reductions.** Energy savings are achieved when Delivery Agents install equipment at small businesses.
- **Participants are more knowledgeable about energy efficiency.** Small businesses gain first-hand understanding about the benefits of purchasing energy efficient equipment.
- **Assist small businesses.** Small businesses experience cost savings from reduced energy bills and maintenance. Small businesses achieve improved lighting quality.

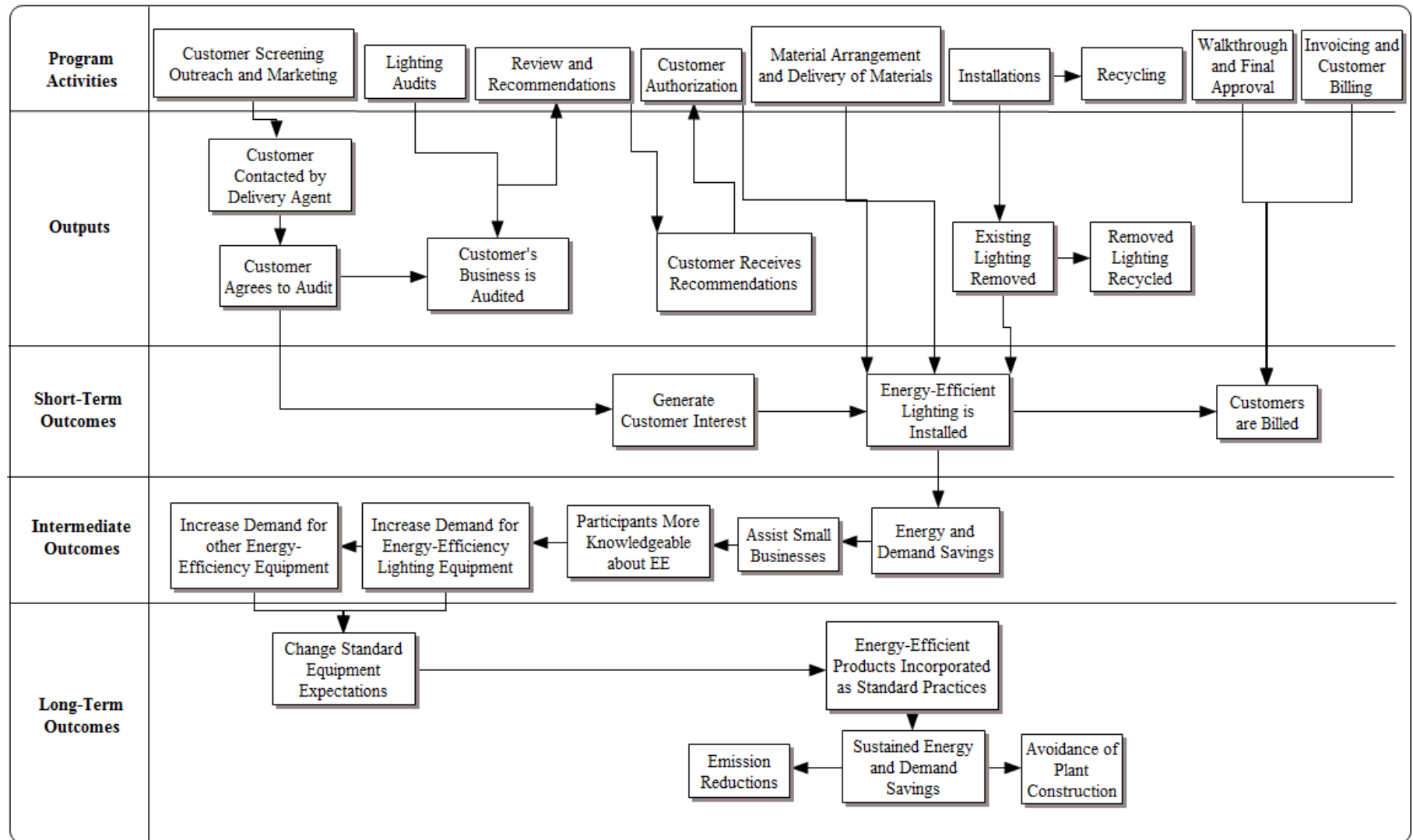
- **Increase in demand for energy efficient lighting equipment.** Participants who install energy efficiency lighting recognize its benefits and continue to purchase energy efficient lighting.
- **Increase in demand for other energy efficient equipment.** Based on their experience with the SBLS program and their increased understanding of the benefits of energy efficient equipment, participants will consider energy efficiency when making decisions about other energy using equipment.

Long-Term Outcomes

- **Sustained energy and demand savings.** Long-term energy and demand savings are achieved.
- **Emission reductions.** Energy savings translate into a reduction in emissions.
- **Avoidance of plant construction.** Demand and energy savings reduce the need for new generation.
- **Raise expectation of equipment standards for small businesses.** Small businesses expect a higher level of standard for energy-using equipment.
- **Small business customers incorporate energy efficient products and services as standard practices.** Due to first-hand experience, efficient lighting products become standard practice for small business customers.

1.1.2 Program Logic Model

Figure 1-1: Small Business Lighting Solutions Program Logic Model



2 Impact Evaluation

2.1 Research Design

Consistent with the free ridership summit recommendation, The NMR Team performed a billing analysis to determine the impacts of the SBLS Program. This evaluation methodology encountered two critical issues that resulted in the evaluation team abandoning the final results of that effort. The first was that an adequate representative group of non-participants could not be developed. After reviewing the non-participant data, we attempted to match the control group members on an annual consumption pattern, but this did not produce an adequately representative control group for the analysis.

The second and more critical issue was that after reviewing the results from a range of analyses (from a simple comparison approach to more complex regression techniques) based only on participant billing data, we determined that the participant bills did not include all accounts for each participant. That is, some of the treated sites had multiple meters that were impacted by the program but that were not included with the billing data provided.

With the incorrect billing data, we calculated a realization rate of 58.2%. This realization rate may have been indicative of program issues such as installation rates or low operating hours of the installed lighting. However, given the basic concern with the underlying data upon which the analysis was performed, it was difficult to have full confidence in the billing analysis results. Therefore, we have decided to rest the performance of the SBLS program in 2010 upon the site work performed in 2008, which included site visits with spott watt metering and verification of measure installation and contact reported operating hours. While not ideal, we believe that under the circumstances, this approach will provide the most confident estimate of impacts available at this time. We recommend that the evaluation of the 2011 program year be based upon on-sites with time of use metering.

2.2 2010 SBLS Savings

Table 2-1 summarizes the meter-level savings tracked by the DSM Administrator in the population of 2010 program participants. In 2010, the SBLS program tracking database had a total of 801 accounts with a total of 12,876 MWh in energy savings and 3,928.8 kW in demand savings. Program activity peaked in July with a total of 2,221 MWh of energy savings. The use of a line loss factor of 1.074, consistent with that used by NSPI for the small business sector, provides an overall 2010 tracking estimate of 13,829 MWh of tracked savings at the generator.

Table 2-1: Summary of SBLS 2010 Program Tracking Savings

Month	Demand Savings (kW)	Energy Savings (MWh)
January	159.0	419
February	179.1	481
March	167.0	481
April	164.4	566
May	268.9	904
June	398.4	1,366
July	659.3	2,221
August	467.5	1,529
September	460.9	1,437
October	363.0	1,289
November	290.9	1,018
December	350.4	1,165
Total	3,928.8	12,876

Table 2-2 shows the 2008 savings by lighting technology installed and the 2010 units installed by technology. In reviewing the information in this table, it is apparent that the relative magnitude of various lighting types installed is largely similar between the two years. T8 fixtures represent the vast majority of activity in each year, with CFL and exit signs showing the greatest amount of activity among the remaining technologies.

Table 2-2: Summary of SBLS 2008 and 2010 Savings by Lighting Type Installed

Lighting Type	2008		2010	
	Energy Savings (MWh)	Percent	Quantity	Percent
T8 Fixture	1,406	89%	27,392	79%
CFL	135	9	5,496	16
Exit	24	2	697	2
T5 Fixture	9	1	26	0.1
HID	--	--	75	0.2
Other	13	1	349	1
Total	1,586	100	34,035	100

2.3 Evaluation Methodology

The approach to determining the impacts of the SBLS program in 2010 was based upon the evaluation results from the 2008 program year. The 2008 program year evaluation comprised 39 site visits with spot watt metering, verification of the installed quantity and technology of lighting, estimates of operating hours by location from the site contact and the gathering of HVAC information for determining interactive effects. The decision to rest the savings impacts of 2010 on 2008 results was based upon several factors. These included the previously mentioned drawbacks of the initial SBLS billing analysis and our experience with observing the historical accuracy of small business tracking systems in other impact evaluations of this C&I sector.

Table 2-3 shows the realization rates for small business lighting installations from recent impact evaluations that used billing analyses or on-sites with M&V performance. The Massachusetts 2007 study likely had some non-lighting measures in the billing analysis, although the vast majority was lighting installations. The realization rates from these studies range from 85% to 120%; with many hovering between 94% and 104%. In general, we believe that the estimation of savings in tracking systems for small business lighting applications tend to be very reliable. This is likely due to the confluence of the ability to specifically account for pre-existing technologies, the notion that the smaller scope of small business lighting likely provides more accuracy in determining installed quantities and the ability of the small business owner to provide accurate hours of use. Note that the realization rate for energy savings in the SBLS program in 2008 was determined to be 93.6% at the meter and 100% at the generator, which also falls into this range of realization rates.

Table 2-3: Recent Small Business Impact Study Results

State/Region	Utility, Program, Program Year	Lighting Realization Rate Result	Evaluation Approach
Connecticut ¹	CL&P and UI Small Business Energy Initiative, 2007	With Interaction: 119.6% Without Interaction: 99.1%	On-site visits with M&V
Massachusetts ²	Cape Light Compact, 2007	104%, $\pm 19\%$ Precision	Billing Analysis
	National Grid, 2007	100%, $\pm 7\%$ Precision	
	NSTAR, 2007	89%, $\pm 7\%$ Precision	
	Unitil, 2007	102%, $\pm 13\%$ Precision	
Massachusetts ³	Cape Light Compact, National Grid, NSTAR and WMECO, 2003	With Interaction: 94.3%, $\pm 6.8\%$ Precision Without Interaction: 97.2%	On-site visits with M&V
New Hampshire ⁴	NHEC, PSNH, Unitil, 2003	T8 fixtures: 99.6%, CFL: 85.2%, Exits: 102.5%	On-site visits with M&V
New York ⁵	NYSERDA Small Commercial Lighting, 2006	94%, $\pm 14\%$ Precision	On-site visits with M&V

¹ <http://www.ctsavesenergy.org/files/CT%20SBEA%202007%20Impact%20Evaluation%20Report.pdf>

² http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/120_SBC_SBS%20impact.pdf

³ http://www.cee1.org/eval/db_pdf/414.pdf

⁴ http://www.cee1.org/eval/db_pdf/549.pdf

⁵ http://www.nyserda.org/Energy_Information/ContractorReports/Nexant/2007%20Reports/Final%20M&V%20Small%20Commercial%20Lighting%20Program.pdf

To more fully assess the transferability of the 2008 SBLS results to the 2010 program year, the NMR Team spoke with program implementers to assess differences in program operations between the two program years. The SBLS program was confirmed to be operating largely in the same manner that it did in 2008. The one notable change to program operations, was that the SBLS Program is now available province-wide, and not just in Pictou and Dartmouth (as it was in 2008). Otherwise, program implementers and program processes are all same as they were in 2008.

It is also important to note that the primary driver of the 2008 realization rate was the observed change in watts between those used in the DSM Administrator tracking system and those gathered in spot watts for the installed lighting. In the 2008 report we noted that: “While there were many observed marginal differences in wattage, two particular fixture types seemed to drive much of the wattage changes overall. For 2L4’T8s, the tracking system assumes 42 Watts per fixture and for 4L4’T8s it was noted to assume 84 Watts per fixture. At the on-sites, our auditor took 19 spot watt measurements from each type of fixture among various sites. The average spot watt measurement for 2L4’T8 fixtures was 7.6% higher (45.2 Watts) than the tracking system assumption and the average spot watt measurement for 4L4’T8 fixtures was 9.5% higher (92 Watts) than the tracking system assumption. These spot watt results for two fairly prominent program light fixtures put downward pressure on both the demand and energy savings estimates.”

In discussing the current wattages used to calculate program savings, we confirmed that the 2L and 4L fixtures above were using the same assumptions as 2008.⁶ Indeed, all wattages currently being used to calculate savings were the same as those used in 2008. Given this consistency and the similarity in measure mix installed, we believe the transfer of the 2008 realization rate – which was driven primarily by wattage changes due to spot watts – remains appropriate to apply to 2010 program activity.

⁶ A new method of populating energy usage in 2011 is currently being implemented.

2.4 Results

Table 2-4 shows the installed annual energy and connected demand savings for the 2010 SBLS Program based on applying 2008 realization rates to the 2010 tracking savings. Note that in 2008, the realization rates at the meter were 93.6% for energy savings and 94.5% for demand savings.

At the program level, the 2010 installed annual energy savings for the SBLS Program was determined to be 12,052 MWh at the meter and 12,944 MWh at the generator with realization rates of 94% and 100%, respectively. The generator estimate used a line loss factor of 1.074. The connected demand savings were calculated to be 3,712.7 kW at the meter and 3,987.5 kW at the generator.

Table 2-4: SBLS 2010 Annual Energy and Connected Demand Savings

Savings Estimate	Annual Energy (MWh)	Connected Demand (kW)
Tracking Savings (at Meter)	12,876	3,928.8
Annual Savings at Meter with Interaction	12,052	3,712.7
Annual Savings at Generator with Interaction	12,944	3,987.5

The 2008 coincident demand factors calculated at the hour ending 6PM were determined to be 44.1% at the meter. Utilizing this factor, we estimate the coincident demand savings associated with the SBLS Program at the hour ending 6pm to be 1,637.3 kW ($0.441 \times 3,712.7$) at the meter and 1,758.5 kW ($1.074 \times 1,637.3$) at the generator.

Table 2-5 presents the final estimates of gross savings for the SBLS. At the program level, the 2010 installed annual energy savings were determined to 12,944 MWh at the generator. The peak demand savings were calculated to be 1,758.5 kW at the generator level.

Table 2-5: SBLS 2010 Savings Summary

	Tracking Estimate		Evaluated Impact Savings	
	Meter	Generator	Meter	Generator
Energy (MWh)	12,876	13,829	12,052	12,944
Peak Demand (kW)	3,928.8	4,219.5	1,637.3	1,758.5

2.5 Spillover

This study quantified participant-like⁷ spillover, which is a situation in which a customer installed additional equipment of the same type as was installed through the program due to program influences. Respondents were asked a series of questions to determine if, due to program influences, they had purchased or installed any additional energy efficiency measures after participating in the program. Only eight of the sixty-five 2010 respondents (12%) reported installing additional energy efficient lighting after

⁷ Participant-like spillover is a conservative approach used to estimate spillover by asking participants about measures installed outside the program that are exactly the same type and efficiency as the ones installed through the program. Non-like spillover is based on asking participants about other energy efficient measures they had installed on their own and without assistance from another DSM program.

participating in the SBLS program, and only four of these respondents said the equipment was of the same efficiency or higher than had been installed through the SBLS program. All four respondents who had installed additional equipment reported that participation in the SBLS program had influenced their decision to do so. For these respondents, the amount of additional demand and energy savings attributable to the program was calculated by multiplying the estimated demand and energy savings as reported in the program records by the percentage of additional lighting installed as reported in the survey. Taking the sum of the additional savings and dividing it by the total committed program savings for the participants surveyed yielded the total spillover rate for the 2010 SBLS program. As in 2008 and 2009, the estimated spillover for the 2010 SBLS program was extremely low (<1%). (Table 2-6) It should be noted that some surveyed participants reported non-like spillover (29%). Based on this, it is possible that the SBLS program resulted in some additional spillover. However, without follow-up inspections at facilities where customers reported spillover, it was impossible to determine the efficiency level of the equipment and estimate the potential savings that could have been attributed to the spillover.

$$\text{Additional Demand Savings} = (\text{EstDemandSav}) \times (\text{QuanAddLight})$$

$$\text{Demand Spillover} = \frac{\sum(\text{Additional Demand Savings})}{(\text{Total Committed Program Demand Savings for Sample})}$$

$$\text{Additional Energy Savings} = (\text{EstEnergySav}) \times (\text{QuanAddLight})$$

$$\text{Energy Spillover} = \frac{\sum(\text{Additional Energy Savings})}{(\text{Total Committed Program Energy Savings for Sample})}$$

Where,

EstDemandSav = Estimated demand savings for the participant from program records

EstEnergySav = Estimated energy savings for the participant from program records

QuanAddLight = Percentage of additional lighting installed as reported in the survey

Table 2-6: Spillover

	2008	2009	2010
<i>Sample size</i>	50	50	65
Demand spillover	0.46%	0.27%	0.17%
Energy spillover	0.84%	0.38%	0.24%

2.6 Free-Ridership

In order to determine the extent of free-ridership, participants were asked a series of questions related to their plans to pursue program measures before participating in the program, as well as the influence and importance of the program on their decisions to install program measures. The free-ridership questions were divided into three general categories: program influence, stated intent, and screening/cross-check questions. (Table 2-7, Table 2-8, and Table 2-9)

Table 2-7: CFL Free-ridership Stated Intent Questions

Question Number	Question	Responses	Free-Rider Score
Now I would like to ask you to consider what actions you would have taken in the absence of the Small Business Lighting Solutions Program. If your company / organization had not participated in the Small Business Lighting Solutions Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have...			
FR2a.	Postponed installing energy efficient lighting by more than one year	Yes	0%
FR2b.	Would not have installed any energy efficient lighting	No	50%
		Don't know	25%
FR2c.	Would have installed less energy efficient lighting	Yes	See (i)
		No	50%
		Don't know	25%
FR2ei.	[IF FR2e = YES] Would you have installed slightly, somewhat or significantly less energy efficient lighting?	Slightly	25%
		Somewhat	25%
		Significantly	0%
		Don't know	25%
FR2d.	Would have installed the same amount of energy efficient lighting that was installed through the program	Yes	50%
		No	25%
		Don't know	25%
Stated Intent Score = average of FR2a, FR2b, FR2c+ci, and FR2d.			

Table 2-8: CFL Free-ridership Program Influence Questions

Question Number	Question	Responses	Free-Rider Score
How influential were the following elements to your decision to participate in the Small Business Lighting Solutions program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to install the energy efficient lighting" and 5 indicates that the program was "extremely influential to your decision to install the energy efficient lighting." How influential was / were the:			
FR3a.	NSPI Incentive	1	50%
FR3b.	Information received during the initial contact by the program representative	2	37.5%
		3	25%
		4	12.5%
FR3c.	NSPI-funded lighting audit	5	0%
		Don't know	25%
Program Influence Score = maximum of FR3a, FR3b, or FR3c.			

Table 2-9: CFL Free-ridership Screening and Cross-check Questions

Question Number	Question	Responses	Free-Rider Score
Screening			
FR1.	Did your organization have any specific plans to pursue lighting improvements prior to talking with anyone about the Small Business Lighting Solutions Program?	Yes No plans Don't know	N/A
Budget Check			
FR3.	Nova Scotia Power paid \$[prompt with actual incentive] of the \$[prompt with actual project cost] total project cost. If your company had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the project including the incentive? Again, the full cost of the project would have been [prompt with project cost].	Yes No Don't know	N/A

Based on their responses to these questions NMR divided respondents into three distinct groups:

- Full free-riders – those participants who would have installed the same energy efficiency measures in the absence of the program.
- Non-free-riders – those participants who would not have installed any of the energy efficient measures within one year of program participation.
- Partial free-riders – those participants who would have installed lighting measures within one year of program participation, but in smaller quantities or of lesser efficiency.

2.6.1 Full Free-riders

Respondents were identified as full free-riders, if they simultaneously met three criteria:

- They stated that their organization had had pre-existing specific plans to install lighting improvements prior to talking with anyone about the SBLS program:
FR1 = YES (see Table 2-9)

AND

- They said that their budget could have accommodated the full cost of installing CFLs or LEDs:
FR3 = 0 (see Table 2-9)

AND

- They said that, in the absence of the SBLS program, they would have installed the same amount of energy efficient lighting that was installed through the program within one year:
FR2a = 2 and FR2d = 1 (see Table 2-7)

Among the 65 respondents, one respondent was classified as a full (100%) free-rider. According to program records, this respondent accounted for less than one-percent of estimated energy (0.09%) and demand (0.14%) savings for the sample of 65 respondents.

2.6.2 Non-Free-riders

Respondents were identified as non-free-riders if they simultaneously met the following three criteria:

- They stated that their organization had had no pre-existing plans to install lighting improvements prior to talking with anyone about the SBLS program:
FR1 = NO (see Table 2-9)

AND

- They said at least one program element had been ‘extremely’ influential to their decision to install energy efficient lighting:
Maximum value of FR5a, FR5b, FR5c = 5 (see Table 2-8)

AND

- They indicated they would have installed no energy efficient lighting in the absence of the program:
Free-rider rate for FR2a, FR2b, and FR2ci = 0% (see Table 2-7)

Among the 65 respondents, two respondents were classified as non-free-riders (0%). According to program records, these two respondents accounted for about seven-percent of the total energy (7.2%) and demand (7.6%) savings for the sample of 65 respondents.

2.6.3 Partial Free-riders

Respondents not identified as either a full free-rider or a non-free-rider were assigned partial free-ridership values based on an analysis of their responses to free-ridership questions. The analysis of responses followed the method outlined by Research Into Action for the Energy Trust of Oregon in their 2006 document “Free-Ridership and Spillover.” Research Into Action’s method relies on calculating two free-ridership rates, one based on answers to questions regarding stated intentions and one based on answers to questions regarding the influence of the program. After calculating the individual free-ridership rates for stated intentions and program influence, the results are averaged to determine a final free-ridership rate.

2.6.3.1 Stated Intentions

In order to derive respondents’ intentions, they were asked to consider what actions they would have taken in the absence of the SBLS program. Respondents were asked four questions as shown in Table 2-7. Based on their responses, each respondent was assigned a free-rider rate for each question and then their overall stated intention free-ridership rate was calculated as the average of the four free-rider rates.

For example, a respondent giving the following responses would be assigned stated intention free-ridership value of 31.25%.

- FR2a = Yes (0%)
- FR2b = No (50%)
- FR2c = Yes; FR2ci = Somewhat (25%)
- FR2d = Yes (50%)

2.6.3.2 Program Influence

In order to determine the influence of the program on respondents, they were asked to rate the influence of three program elements on their decision to install energy efficient lighting on a scale of one to five, where one meant the program had ‘had no influence at all’ on their decision and five meant that the program had been ‘extremely influential’ to their decision to install energy efficient lighting.

2.6.3.3 Impact of Budget

For respondents who received a stated intentions free-ridership rate of 50%, a cross-check was performed with a question regarding whether or not their budget could have accommodated the project in the absence of the program. If respondents said their budget could have accommodated the project no adjustments were made; if they said their budget could not have accommodated the project, their free-rider stated intent score was reduced to 25%.

2.6.4 Combining Scores and Weighting

Finally, to compute the overall free-ridership rate for each participant, their free-rider stated intent score was averaged with their program influence free-rider score.

In order to calculate the final free-ridership rate for the SBLS program, each participant was assigned a weight based on estimated energy and demand savings from program records. These calculations were performed separately for energy and demand. The resulting free-ridership proportions for the 2010 SBLS program were 13.1% for demand savings and 13.6% for energy savings. As Table 2-10 shows, the 2010 free-ridership levels were significantly higher in 2010 compared to 2009 and statistically similar to those in 2008. It is important to note that NMR used three separate methods to calculate free-ridership between 2008 and 2010 for the SBLS program.

- In 2008, NMR used a multiplicative approach and used a series of questions based on the standardized methods outlined by PA Consulting in 2003.⁸
- In 2009, NMR used a similar approach as in 2008. However, for the 2009 free-ridership calculations, the NMR team adopted the use of an arithmetic mean for two components of the CFL free-ridership as well as a more conservative scoring method for all of the factors in the free-ridership calculations.
- In 2010, based on the decision of the DSM Administrator-coordinated Free-ridership Symposium (May 2010), NMR completely revised the free-ridership questions included in the 2010 survey and mirrored the free-ridership calculations developed for the Energy Trust of Oregon by Research into Action.

Table 2-10: Free-ridership⁹

	2008		2009		2010	
	Demand	Energy	Demand	Energy	Demand	Energy
<i>Sample size</i>	50	50	50	50	65	65
Free-ridership rate	4.7%	5.5%	2.1%	1.8%	13.1%	13.6%

⁸ PA (2003) *Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report*. Submitted June 16, 2003

2.7 Net-to-Gross Ratio

For the SBLS program, the net-to-gross ratio is calculated based on spillover and free-ridership. For the 2010 program year, the net-to-gross ratio for the program was 86.6% for energy savings and 87.0% for demand savings.

$$\text{Net-to-Gross Ratio} = 1 + (\text{Spillover}) - (\text{Free-ridership})$$

2.8 Energy Savings Estimation

Table 2-11 presents the net installed annual energy and demand savings for the SBLS program in 2008, 2009, and 2010. For the 2010 program year, the generator-level impacts were estimated to be 11,210 MWh of energy savings and 1,529.5kW of demand savings. These savings fell short of the energy savings goal of 13,980 MWh and the demand savings goal of 3,300 kW.

Table 2-11: Program Energy Savings Estimates

	2008		2009		2010	
	Energy (MWh)	Coincident Demand (kW)	Energy (MWh)	Coincident Demand (kW)	Energy (MWh)	Coincident Demand (kW)
Installed annual savings at meter	1,491	495.3	4,435	735.9	12,052	1,637.3
Installed annual savings at generator	1,597	530.5	4,768	791.1	12,944	1,758.5
Net-to-gross ratio	95.3%	95.8%	98.6%	98.2%	86.6%	87.0%
Net annual savings at meter	1,421	474.5	4,372	722.4	10,437	1,424.5
Net annual savings at generator	1,522	508.2	4,701	777.2	11,210	1,529.9

3 Process Evaluation

3.1 Methodology

The process evaluation of the 2010 SBLS program relied upon in-depth interviews conducted with program staff, Delivery Agents, the Materials Vendor and the lighting recycler, as well as a telephone survey of program participants. Copies of the interview guides are included in Appendix A **Error! Reference source not found.** to this report.

3.1.1 In-depth Interviews

NMR staff conducted one in-depth interview in July of 2010 with the SBLS program manager. The interview covered a variety of program-related topics including program goals, program theory, delivery, changes to the program in the past year, and perceived successes and challenges. NMR drew upon the insights gained in this in-depth interview to develop the participant survey instrument and the in-depth interview guide for the Delivery Agents, Materials Vendor and Recycling Contractor.

The NMR team conducted five in-depth interviews in August 2010—three with the SBLS Delivery Agents, one with the SBLS Materials Vendor and one with the Recycling Contractor.¹⁰ The interviews covered a variety of topics including interaction with program staff, roles within the program, program process, satisfaction, data tracking, participant perceptions, and spillover.

3.1.2 Telephone Survey and Sample Design

NMR completed telephone surveys with a total of 65 program participants. The survey was conducted by NMR's subcontractor, Interviewing Services of America, out of its offices in Halifax, NS. The interviews were conducted between August 2010 and December 2010 utilizing computer-assisted telephone interviewing (CATI). The sample of participants was provided by the DSM Administrator from its program tracking database which, as of November 2010, included 418 participants. In an attempt to ensure a robust sample, NMR set interview quotas based on the relative proportion of participants in each region. As Table 3-1 shows, the final sample contained similar proportions of respondents in each of the six regions. Since each region is assigned to one of three Delivery Agents, the final sample also contained similar proportions of respondents served by each of the three Delivery Agents. Participants surveyed represented approximately 14% of all committed savings for the 418 participants available at time of surveying.

¹⁰ The SBLS Materials Vendor also acts as a Delivery Agent and the Recycling Contractor. For these interviews, the interviewee responded to questions from the perspective of the Materials Vendor, Delivery Agent and Recycling Contractor.

Table 3-1: Final Sample

Region	Population	Sample
	<i>N = 418</i>	<i>n = 65</i>
Cape Breton	8%	8%
Central	28%	32%
Dartmouth	30%	25%
Halifax	8%	6%
Southeast	13%	14%
Southwest	13%	15%

The participant survey was used to understand the following:

- Spillover and free-ridership
- Participant motivations and barriers
- How participants learned about program
- Use of new lighting
- Satisfaction with program
- Future intentions
- Energy attitudes and behaviors
- Participant firmographics

3.1.3 Sampling Error

Table 3-2 shows the estimated population, sample size and associated sampling error at the 90% confidence level for the telephone surveys.

Table 3-2: Sample Size and Sampling Error

	Population	Sample Size	Sampling Error at 90% Confidence Interval
Participants 2008	93	50	$\pm 8.0\%$
Participants 2009	214	50	$\pm 10.2\%$
Participants 2010	801	65	$\pm 9.8\%$

3.2 Program Goals and Design

The 2010 SBLS program was sponsored by the DSM Administrator. The program contracted with three competitively selected service providers, termed “Delivery Agents,” to provide services throughout Nova Scotia. The program divides the province into six geographical areas—Cape Breton, Central, Dartmouth, Halifax, Southeast and Southwest and assigns each region to a Delivery Agent. These Delivery Agents were the primary customer contact for the program. The Delivery Agents hired electrical contractors to complete lighting retrofits at participating businesses. In addition to Delivery Agents, the program contracted with a single “Materials Vendor” and “Recycling Contractor,” who was responsible for supplying lighting materials to the Delivery Agents, and collecting materials (lamps and fixtures) for recycling.

3.3 Program Responsibility and Communication

The responsibilities of the SBLS program were distributed across the DSM Administrator, Delivery Agents, the Materials Vendor and the Recycling Contractor as described below.

The DSM Administrator was responsible for the following:

- Pre-qualifying customers
- Authorizing Delivery Agents to proceed
- Reviewing audits
- Inspecting completed projects
- Resolving complaints
- Compensating Delivery Agents

Delivery Agents were responsible for the following:

- Contacting customers
- Scheduling audits
- Conducting audits
- Preparing energy savings analyses using a tool provided by the DSM Administrator
- Preparing job cost estimates
- Presenting customers with the cost and savings analysis
- Assisting customers with program application
- Obtaining customer authorization signatures
- Developing installation work orders
- Purchasing materials from the Materials Vendor
- Obtaining all necessary permits
- Scheduling and coordinating site work
- Ensuring the project scope of work was followed
- Maintaining jobsite safety
- Completing projects on schedule
- Meeting project cost estimates
- Performing post-installation inspections and correcting deficiencies
- Overseeing material disposal and/or recycling

- Obtaining customer sign-off and acceptance
- Delivering project reports to the DSM Administrator
- Administering subcontractor payments

The Materials Vendor was responsible for the following:

- Maintaining adequate stock of an agreed-upon list of lighting products
- Providing warranty replacements under the terms of his or her contract
- Notifying the DSM Administrator of any manufacturers' notices relating to the agreed-upon list of lighting products
- Delivering lighting products to participant sites

The Recycling Contractor was responsible for the following:

- Picking up lamps and fixtures removed from installation-sites

During the 2008 evaluation, the DSM Administrator's program manager, the Materials Vendor, the Delivery Agents, and the electrical contractors noted several issues with materials acquisition and delivery. The Delivery Agents and electrical contractors reported on-going issues with deliveries of materials, including receiving the wrong materials, receiving the wrong quantity of materials and receiving materials late or not at all. In the 2008 evaluation, NMR recommended that the program institute a mechanism for the tracking and verification of deliveries with a clearly-defined feedback loop to the Materials Vendor. In 2009, the DSM Administrator's program manager reported that the issues had been resolved between the Materials Vendor and the Delivery Agents. In addition, the DSM Administrator included a new delivery protocol in the program contracts with the Delivery Agents and the Materials Vendor for the 2010 SBLS program. Despite this, during the 2010 evaluation, it was revealed that the materials issues first discovered during the 2008 evaluation, and resolved in 2009 had returned to the program in 2010.

3.3.1 Materials Purchasing and Delivery Issues

The program manager, the Materials Vendor, and the Delivery Agents commented about issues with materials acquisition and delivery. The Delivery Agents reported on-going issues with deliveries of materials, including receiving the wrong materials, receiving the wrong quantity of materials and receiving materials late—the same issues as reported in the 2008 evaluation. As in the 2008 evaluation, the Delivery Agents said that the Materials Vendor had made some improvements and was working to resolve the issues, but at the time of the in-depth interviews the problems were still on-going.

When asked why they thought the problems had begun again, the Delivery Agents and the Materials Vendor, both said that the materials delivery issues had re-emerged when the program expanded to serve the entire province and the Materials Vendor began using a different, more centrally located, warehouse. While both the Delivery Agents and the Materials Vendor agreed that there had been problems with materials delivery, they disagreed on the scale of these issues. According to the two Delivery Agents not affiliated with the Materials Vendor, anywhere between 60 to 80% of all deliveries had an issue—arriving late, or containing wrong materials or wrong quantities. Delivery Agents further estimated that when orders had incorrect equipment or quantities, 10 to 20% of the order was incorrect. According to the Materials Vendor, the selecting accuracy for orders was 94.2% between June 24th and August 23rd

2010.^{11,12} Despite requests made to the Delivery Agents and Materials Vendor for additional information, NMR was unable to determine the true scale of the materials delivery issues in the 2010 SBLS program.

3.3.1.1 Resolution

Despite the implementation of the ‘Customer Continuous Improvement Quality Action Plan,’ the Delivery Agents continued to express concern with how materials purchasing operated as part of the SBLS program. In light of these concerns, the DSM Administrator decided to move away from a single source Materials Vendor in 2011. Under this alternate program design, instead of Delivery Agents using a sole source Materials Vendor subject to price constraints, Delivery Agents are responsible for obtaining their own materials and adhering to a maximum price constraint for work completed. This alternate program design allows Delivery Agents to choose their own source of lighting materials and allows them to competitively shop for Materials Vendors that can meet their price and customer service requirements. The NMR team believes that such an approach may alleviate some concerns for Delivery Agents and allow the program to continue to grow and operate without constraints imposed by materials delivery issues. With the implementation of this alternative program design it will become increasingly important for the DSM Administrator to monitor the performance of Delivery Agents in order to achieve 2011 targets and to ensure continued high levels of customer service. In addition, the DSM Administrator should consider requiring that Materials Vendors chosen by Delivery Agents in 2011, and future program years, meet minimum criteria for reliability and materials quality.

3.4 Outreach and Marketing

Direct marketing for the SBLS program was performed by the Delivery Agents. In the in-depth interviews, Delivery Agents indicated that, with the expansion of the program into new markets, they had increased their active outreach with phone calls and in-person visits. According to the Delivery Agents, while they still received inquiries generated by word-of-mouth, more active marketing had been required to meet the aggressive program goals. In addition to the outreach efforts of the Delivery Agents, the DSM Administrator advertised and promoted the program through its website, as appropriate through other programs, and informed customers about the program when they contacted the call center.

¹¹ Selection accuracy is based on all lines on an order being 100% accurate

¹² It is important to note that on June 24th the Materials Vendor implemented a ‘Customer Continuous Improvement Quality Action Plan’ to improve selecting accuracy and this figure does not include any orders prior to June 24th 2010.

3.5 Awareness

Respondents to the survey of participants were asked how they had first become aware of the SBLS program. Nearly three out of ten (28%) cited sources associated with either NSPI or SBLS. In addition, more than one-fifth (23%) of respondents cited word of mouth and more than one-fifth (22%) cited electricians, contractors or vendors. (Table 3-3) These sources were consistent with the marketing methods utilized by the SBLS program.

Table 3-3: Source of First Awareness of SBLS Program¹³

Source	2008	2009	2010
<i>Sample size</i>	50	50	65
Friend or business associate	42%	22% ^σ	23% ^{†6}
NSPI staff/presentation	2	16 ^σ	18 [†]
Contractor or vendor	12	32 ^σ	14 ⁶
NSPI website	4	2	9 ⁶
Electrician	--	--	8 ^{†6}
Phone call from SBLS representative	14	4 ^σ	5
SBLS literature received through mail	6	2	5
Another participant	4	2	5
Newspaper	6	2	3
Landlord	--	--	2
In-person visit by SBLS representative	10	8	-- ^{†6}
NSPI (unspecified mode of contact)	--	2	--
NSPI e-mail	--	2	--
NSPI bill insert	--	2	--
Don't know	--	--	9 ^{†6}
Other	--	2	--

¹³ Throughout this report, the symbol 'σ' is used to indicate that results between 2008 and 2009 participants are significantly different at the 90% confidence level; the symbol '†' is used to indicate that results between 2008 and 2010 participants are significantly different at the 90% confidence level; the symbol '6' is used to indicate that results between 2009 and 2010 participants are significantly different at the 90% confidence level.

3.6 Prior Purchases and Plans

About one-half of the 2010 respondents (52%) reported having purchased some type of energy efficient lighting product prior to participating in the SBLs program, statistically similar to 2008 and 2009 respondents (56% and 42%). Among the 2010 respondents who had previously purchased energy efficient products, more than seven out of ten (71%) reported having purchased CFLs and two-fifths (20%) reported retrofitting T-12 lighting with T8s or T5s. (Table 3-4)

Table 3-4: Prior Purchases of Efficient Lighting Products

Previously Purchased Products	2008	2009	2010
<i>Sample size</i>	50	50	65
Yes	56%	42%	54%
Type of Purchases	Multiple Response		
<i>Sample size</i>	28	21	45
CFLs	57%	62%	71%
T-12s retrofit to T8s or T5s	36	33	20
LED exit lights	7	5	11
Metal Halide or High Pressure Sodium	4	--	--
Motion sensors	4	--	3
Electronic ballasts	4	--	--
Other	--	--	9 ^{†6}
Don't know	4	5	3

About two-fifths of the 2010 respondents (37%) reported having had specific plans to pursue lighting improvements prior to talking with anyone about the Small Business Lighting Solutions Program—similar to 2008 (42%) and significantly more than in 2009 (22%). (Table 3-5)

Table 3-5: Prior Plans to Pursue Lighting Improvements

Plans	2008	2009	2010
<i>Sample size</i>	50	50	65
Yes	42%	22% ^σ	37% ⁶
No	58	78 ^σ	62 ⁶
Don't know	--	--	2

3.7 Post-participation Energy Efficiency Actions

Only eight of the sixty-five 2010 respondents (12%) reported installing additional energy efficient lighting after participating in the SBLS program, and only four of these respondents said the equipment was of the same efficiency or higher than that installed through the SBLS program. All four of the respondents who had installed additional equipment, reported that participation in the SBLS program had influenced their decision to do so. (Table 3-6)

Table 3-6: Post-Program Lighting Installations

Any Additional Lighting	2008	2009	2010
<i>Sample size</i>	50	50	65
No	94%	96%	86% ⁶
Yes	4	4	12
Don't know	2	--	2
Efficiency of Additional Lighting	2008	2009	2010
<i>Sample size</i>	2	2	8
Same or higher than lighting installed through program	2	2	4
Influence of Program	2008	2009	2010
<i>Sample size</i>	2	2	4
SBLS influenced decision	2	1	4
SBLS did not influence decision	--	1	--

Respondents were also asked if participation in the SBLS program had influenced them to pursue additional energy efficiency actions other than lighting improvements. About three in ten respondents (29%) reported that participation had influenced them to take additional actions. Among the nineteen respondents who had taken additional actions, five reported actions related to heating systems, three had made behavior changes, three had taken actions related to controls, and three had made improvements to their ceilings. Other subsequent actions reported by respondents included upgrading insulation and actions related to air conditioners, water tanks, lighting, energy audits, windows and air compression. (Table 3-7)

Table 3-7: Influence of Program on Additional Energy Efficiency Actions*

Program Influenced Additional Actions	2008	2009	2010
<i>Sample size</i>	50	50	65
No	62%	76%	66%
Yes	34	22	29
Don't Know	2	2	5
Type of Action Taken	2008	2009	2010
<i>Sample size</i>	19	10	19
Heating	35%	20%	26%
Behavior changes	--	10	16 [†]
Controls	6	--	16 ⁶
Efficient roof/ceiling	--	--	16 ^{†6}
Insulation	12	10	11
Air Conditioning	--	--	11 ^{†6}
Water tank	--	--	11 ^{†6}
Additional energy efficient lighting	--	10	5
Technical assessments/audit	6	20	5
Windows	--	--	5
Air Compression	--	--	5
Continue program at another facility	12	10	--
Awareness of energy consumption	--	10	--
Refrigeration	6	--	--
Changed lights at home	6	--	--
Fuel switching	6	--	--
Energy efficient washers/dryers	--	10	--
Other	18	-- ^σ	5

3.8 Lighting Usage Behaviors

Behavioral changes due to program participation can impact energy usage. Customers might use their new lights more than those they replaced because they cost less to operate or they might use them less because of increased awareness of energy use. Customers may also use their new lights more than those they replaced, but instead of less efficient bulbs in other fixtures. Eighty-five percent of 2010 respondents reported using the new lighting the same, 6% reported using it more, 6% reported using it less and 3% reported using it more but instead of other less efficient lighting. As in 2008 and 2009, these results indicate that energy savings were not impacted by behavioral changes as a result of the influence of the SBLS program. (Table 3-8)

Table 3-8: Use of New Lighting

Relative Use	2008	2009	2010
<i>Sample size</i>	50	50	65
Use about the same	90%	90%	85%
Use more	--	2	6
Use less	2	6	6
Use more but instead of other less efficient lights	--	--	3
Don't know	8	2	-- [†]

3.9 Participant Motivations and Barriers

When asked their reasons for participating in the SBLS program, the large majority of the 2010 respondents (89%) reported saving on energy costs/bills as a primary or secondary motivation, with over seven out of ten (71%) citing this as their primary motivation. The importance attributed to saving on energy costs/bills was consistent with that cited by 2008 and 2009 respondents. Improving existing lighting conditions was the second most frequently mentioned motivation, mentioned by nearly two-fifths of respondents as a primary (14%) or secondary (25%) motivation. (Table 3-9)

Table 3-9: Reasons for Participating*

Motivations	2008		2009		2010	
	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
Save on energy costs/bills	70%	27%	76%	22%	71%	18%
Improve existing lighting conditions	6	31	10	26	14	25
Reduce maintenance costs	--	2	2	8	8 [†]	6
Take advantage of program incentives	2	8	6	4	5	8
Protect the environment	4	6	4	14	3	12
Upgrade old lighting	16	11	-- ^σ	-- ^σ	-- [†]	2
Energy Efficiency	--	--	2	2	--	2
Already changing out lights	2	--	--	--	--	--
Reduce carbon footprint	--	4	--	4	--	8
Get experts to do audit and installation	--	--	--	2	--	--
Replace non-working equipment	--	2	--	--	--	3
To increase resale value	--	2	--	--	--	--
Don't Know	--	6	--	18	--	17 [†]

Similar to 2008 and 2009 respondents, the vast majority of 2010 respondents (88%) reported facing no barriers to participating in the SBLS program. (Table 3-10) The specific barriers reported by respondents are shown in Table 3-11.

Table 3-10: Barriers to Program Participation

Any Barriers	2008	2009	2010
<i>Sample size</i>	50	50	65
No	88%	90%	88%
Yes	10	10	12
Don't know	2	--	--

Table 3-11: Barriers Faced During Program Participation

Specific Barriers	2008		2009		2010	
	Most Important	Second Most Important	Most Important	Second Most Important	Most Important	Second Most Important
<i>Sample size</i>	5	5	5	5	8	8
Concern that savings would be less than estimated	1	--	--	--	1	--
Program limited to specific lighting	--	--	--	1	1	--
Equipment does not meet payback requirements	--	1	--	--	1	--
Too little incentive	--	--	--	--	1	--
Decision is made elsewhere	--	--	--	--	1	--
Building was vacant	--	--	--	--	1	--
Problems with delivery/inventory	1	--	1	--	--	--
One light did not work	1	--	--	--	--	--
Cost savings not worth the effort of applying	1	--	--	--	--	--
Work not yet completed	1	--	--	--	--	--
Timing and scheduling of work to be done	--	1	1	--	--	--
Finding out point of contact	--	--	1	--	--	--
Required to be here at least one year	--	--	--	1	--	--
Issues with building tenants	--	--	2	--	--	--
Problems with existing wiring	--	--	--	1	--	--
Lack of information to make an informed decision	--	--	--	--	--	1
Communication Issues	--	--	--	--	--	1
Other	--	--	--	--	1	--
Don't Know	--	3	--	2	--	6

About three-fourths of the 2010 respondents (74%) 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. Nine of the sixteen renters (56%) reported that they did not need to obtain permission from the building owner in order to participate in the SBLS program. (Table 3-12) Four of the six respondents who had needed to obtain permission from the building owner reported that it had not been a significant barrier. Among the two respondents who said obtaining permission from the building owner had been a significant barrier, one said that it had been a ‘very significant barrier.’ (Table 3-12)

Table 3-12: Building Ownership Status and Need for Owner Permission

Ownership Status	2008	2009	2010
<i>Sample size</i>	50	50	65
Own	78%	74%	74%
Lease	22	26	25
Don’t know	--	--	2
Owner’s Permission Required	2008	2009	2010
<i>Sample size</i>	11	13	16
Yes	18%	31%	38%
No	82	69	56
Don’t know	--	--	6

Table 3-13: Extent of Barrier Posed by Needing Owner’s Permission

Barrier of Obtaining Owner’s Permission	<i>Sample size</i>	Rating: 5= ‘very significant barrier’ and 1 = ‘not a significant barrier’				
		5	4	3	2	1
2008	2	1	--	--	--	1
2009	4	--	--	1	--	3
2010	6	1	1	--	--	4

3.10 Satisfaction with the Program

The great majority of 2010 respondents (97%) reported that they were satisfied with the program overall, and seven out of ten (70%) reported they were ‘very satisfied.’ More than eight out of ten 2010 respondents reported that they were ‘satisfied’ with all aspects of the program. (Table 3-14) Note, however, that in an in-depth interview, one SBLS participant expressed dissatisfaction with the program contractor.

Table 3-14: Satisfaction with SBLS Program (% Very Satisfied / Satisfied)

Aspect of program	2008	2009	2010
<i>Sample size</i>	50	50	65
Program overall	100%	94%	97%
Delivery agent (single point of contact)	94%	98%	91% ⁶
Assistance with program application	98%	98%	94%
Audit technician	93%	99%	90% ⁶
Audit cost and savings analysis	93%	85%	96% ⁶
On-site lighting audit	98%	93%	95%
Quality of vendors who provided recommendations	98%	94%	92%
Audit recommendations	96%	91%	92%
Initial contact with contractors	93%	96%	82% ^{†6}
Scheduling and timing of installation	86%	94%	86%
Interaction/ communication with contractors	94%	94%	87%
Installation process	87%	92%	94%
Completion of the project on schedule	87%	90%	84%
Rebate/Incentive amount	96%	93%	98%
Paperwork and procedures required to receive incentives	98%	98%	95%

Respondents were asked to rate their satisfaction with various aspects of the lighting equipment that had been installed through the SBLS program. Nearly all of the participants (93% or greater) reported that they were satisfied with the different aspects of the lighting equipment installed through the SBLS program, similar to 2008 and 2009. (Table 3-15)

Table 3-15: Satisfaction with Lighting Equipment (% Very Satisfied / Satisfied)*

Aspect	2008	2009	2010
<i>Sample size</i>	50	50	65
Light quality	88%	98%	99% [†]
Brightness of lighting	93%	96%	97%
Time required for lights to come on	93%	98%	93%
Flickering	86%	91%	98% [†]
Measure lifespan	95%	94%	97%
Energy savings	95%	82%	94% ⁶

* Those giving a rating of 5 or 4 on a scale where 5= ‘very satisfied and 1 = ‘not at all satisfied.’

3.10 Future Energy Efficiency Actions

The large majority of 2010 respondents (63 out of 65) reported that they would be likely to purchase energy efficient equipment when replacing equipment in the future. (Table 3-16)

Table 3-16: Likelihood of Purchasing Energy Efficiency 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	DK
2008	50	78%	20	--	--	2	--
2009	50	64%	28	6	2	--	3
2010	65	77%	22	2	--	--	1

Respondents who had not reported pursuing any additional measures were asked about any barriers that had prevented them from pursuing additional energy efficiency measures. Nearly two-fifths (36%) of the 2010 respondents who had not pursued additional measures reported a lack of some type of resource to pursue them—16% reported a lack of financing, 11% reported a lack of information, and 9% reported a lack of time. Another two-fifths of respondents (38%) reported that they did not need additional measures or were not aware of any other available measures. (Table 3-17)

Table 3-17: Barriers to Pursuing Additional Energy Efficient Equipment

Barrier	2008	2009	2010
<i>Sample size</i>	33	39	44
No need/No additional measures to upgrade	27%	23%	20%
Lack of financing	15	20	16
Lack of information	3	13	11
Lack of time	12	5	9
No interest	--	--	7 ^{†6}
Plan to install measures in the future	--	3	5
Concern that actual bill savings less than estimated	3	8	2
Cost	--	--	2
Moving facilities elsewhere	6	3	2
Don't own building	--	--	2
Equipment does not meet payback requirements	--	--	2
Have not been approached with incentives/offers	--	--	2
Mixed opinions	3	--	--
SBLs program still in progress	15	5	-- [†]
Have not considered other measures	6	5	--
Switched to another utility	--	3	--
Installed other measures before program	--	3	--
Not aware of rebates for other measures	6	3	--
Other	--	7	-- ⁶
Don't know	3	--	18 ^{†6}

3.11 Energy Attitudes and Behaviors

About one-half of 2010 respondents provided a valid response to a question regarding energy costs as a percentage of their annual operating budget. Among them, energy costs accounted for an average of 12.1% of annual operating budgets, relatively higher than in 2009 (6.8%), although not significantly so, and about the same as reported in 2008 (15.7%). Among 2010 respondents, energy costs accounted for less than 20% of the annual operating budget for nearly all of the 2009 respondents (87%). (Table 3-18)

Table 3-18: Energy Costs as a Percent of Annual Operating Budget

Percent of Budget	2008	2009	2010
<i>Sample size</i>	29	21	37
Less than 10%	45%	71% ^σ	68% [†]
10-19%	10	24	19
20-29%	28	5 ^σ	19 ⁶
30-39%	7	--	14 ⁶
40-49%	3	--	--
50-59%	3	--	--
60-69%	3	--	--
70-99%	--	--	--
Average Percent	15.7%	6.8%^σ	12.1%

Nearly all of the 2010 respondents reported that reducing energy usage (97%) and managing energy costs (96%) were important to their businesses; about one out of four respondents reported that reducing energy usage (75%) and managing energy costs (74%) were ‘very important’ to them. (Table 3-19)

Table 3-19: Importance of Energy Management (% Very Important / Important)*

Aspect	2008	2009	2010
<i>Sample size</i>	50	50	65
Reducing energy usage	96%	94%	98%
Managing energy costs	94%	96%	96%

* Those giving a rating of 5 or 4 on a scale where 5= ‘very important’ and 1 = ‘not at all important.’

Two out of three 2010 respondents provided a valid response to a question regarding their organizations' payback requirements for energy efficiency measures. Among them, about three out of five (63%) required that energy efficiency measures pay for themselves in less than two years, and one-third (33%) required that energy efficiency measures pay for themselves in less than one year. (Table 3-20)

Table 3-20: Required Payback for Energy Efficiency Measures

Months	2008	2009	2010
<i>Sample size</i>	37	33	43
0 to 12	38%	48%	33%
13 to 24	27	21	30
25 to 36	16	12	19
37 or more	19	18	18
Average months	31.8	25.9	27.3

3.12 Firmographics

About three out of four 2010 respondents (74%) reported owning their facilities. (Table 3-21)

Table 3-21: Ownership Status of Facilities

Status	2008	2009	2010
<i>Sample size</i>	50	50	65
Own	78%	74%	74%
Lease	22	26	25
Don't know	--	--	2

Respondents in the 2008, 2009 and 2010 samples represented a diverse variety of business types. (Table 3-22)

Table 3-22: Business Type

	2008	2009	2010
<i>Sample size</i>	50	50	65
Service	14%	24%	31% ⁶
Retail – other than mall	18	18	17
Office	10	12	9
Food service/Grocery	2	8	8
Warehouse and storage	14	--	5 ⁶
Health care – inpatient	--	--	5 ⁶
Curling Rink / Bowling Alley	--	--	5
Car dealership/repair	16	2 ^σ	3 [†]
Manufacturing	12	4	5
Health care – outpatient	4	2	2
Enclosed mall or strip mall	2	2	2
Workshop	--	2	2
Multi-purpose	--	--	2
Religious worship	2	--	2
Public Assembly	--	--	2
Vacant	--	--	2
Lodging	2	4	--
Education	--	2	--
Construction	--	2	--
Public Library	--	2	--
Public order and safety	4	2	--
Wholesaler	--	2	--
Animal shelter	--	2	--
Equipment rental	--	2	--
Publishing	--	2	--
Transportation	--	2	--
Other	--	4	--

Eight out of ten 2010 respondents (80%) reported having facilities with less than 50,000 square feet of floor space, and nearly one-half (48%) reported having facilities with less than 10,000 square feet of floor space. (Table 3-23)

Table 3-23: Building Floor Space

	2008	2009	2010
<i>Sample size</i>	50	50	65
93 or less (1,000 or less)	4%	6%	3%
93 to 463 (1,000 to 4,999)	22	26	25
464 to 929 (5,000 to 9,999)	22	26	20
930 to 4,645 (10,000 to 49,999)	32	22	32
4,646 to 9,290 (50,000 to 99,999)	4	--	5 ⁶
Over 9,290 (Over 100,000)	0	4	2
Don't know	16	16	14

More than three out of four 2010 respondents (77%) reported having fewer than 20 employees and three out of five respondents (60%) reported having fewer than 10 employees. (Table 3-24)

Table 3-24: Full-time Equivalent Workers

	2008	2009	2010
<i>Sample size</i>	50	50	65
Fewer than 5	14%	12%	37% ^{†6}
5 to 9	28	28	23
10 to 19	24	22	17
20 to 49	22	36	11 ⁶
50 to 99	10	-- ^σ	5 ⁶
100 to 249	--	--	2
250 or more	--	2	--
Don't know	2	--	6 ⁶

More than four-fifths of 2010 respondents (86%) reported that their businesses operated less than 80 hours each week. Overall, 2010 respondents reported average operating hours of 60 hours each week. (Table 3-25)

Table 3-25: Hours of Operation

Hours	2008	2009	2010
<i>Sample size</i>	49	49	63
Less than 40	2%	2%	11%
40 to 79	88	74 ^σ	75
80 to 119	4	14 ^σ	8
120 or more	6	10	6
Average hours	59	67	60

About eight out of ten 2010 respondents (82%) reported that their businesses were independent and not part of a larger company. (Table 3-26)

Table 3-26: Type of Company

Type	2008	2009	2010
<i>Sample size</i>	50	49	62
Independent	84%	70% ^σ	82%
Part of a larger company	16	30 ^σ	16 ^δ
Franchise	--	--	2

Appendix A Interview Guides

Draft participant QUESTIONNAIRE: NSPI SBLS PROGRAM

Final: July 22, 2010

Hello, I am with NMR Group, and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm recently participated in Nova Scotia Power's Small Business Lighting Solutions program. We would appreciate fifteen minutes of your time to answer some questions related to your participation in this program, the information you provide will be used to help Nova Scotia Power evaluate and improve the program. Is this a good time for you?

1. Are you the person in your company / organization who is most knowledgeable about your experience with the Small Business Lighting Solutions program?
 1. Yes (If YES go to Q3)
 2. No (Continue)
2. Is there someone else at your company / organization who would know about your company / organization's participation in Nova Scotia Power's Small Business Lighting Solutions Program?
 1. Yes (Ask for name: _____ and telephone #: _____) (Thank and terminate. Schedule interview with best contact.)
 2. No (Thank and terminate)
3. Our records indicate that your company / organization participated in Nova Scotia Power's Small Business Lighting Solutions Program. Is this correct?
 1. Yes (Go to Q4)
 2. No (Note: Thank and terminate call.)

Section I. Reasons for participating & Previous Purchases

4. Did your company / organization participate in any other Nova Scotia Power energy efficiency programs before participating in the Small Business Lighting Solutions Program?
 1. Yes
 2. No (Go to Q7)
 9. Don't know (Go to Q7)
5. Which programs did your company / organization participate in prior to the Small Business Lighting 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

6. **(REPEAT FOR EACH PROGRAM IDENTIFIED IN Q6)** In what year did your company / organization participate in [Program x]?
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
 99. (Don't Know)
7. How did you first learn about the Small Business Lighting Solutions Program? [RANDOMIZE AND READ 1-8, THEN 9] **(choose one)**
1. From a phone call from a Small Business Lighting Solutions Program representative
 2. From Small Business Lighting Solutions Program literature I received in the mail
 3. From Nova Scotia Power's website
 4. From a Nova Scotia Power presentation
 5. From a Nova Scotia Power 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 Lighting Solutions program
 9. Or some other way? (Please Specify: _____)
 99. (Don't know)
8. What was the ONE most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)

9. What was the second most important reason your company / 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)
 10. (Recommended by contractor)
 11. (Past participation in utility programs)
 12. (Other (Please explain _____))
 99. (Don't know/Don't recall)
10. Prior to your company / organization participating in the Small Business Lighting Solutions program, had your company / organization purchased any energy efficient lighting products?
1. Yes
 2. No (Go to Q12)
 9. (Don't know/Don't recall (Go to FR1))
11. What purchases of energy efficient lighting had your company / organization made before participating in the Small Business Lighting Solutions program? **(Record all that apply)**
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
 5. Other (Specify: _____)
 9. (Don't know/Don't recall)

Section II. Free-rider & Additional Actions Taken

FR1. Did your company / organization have any specific plans to pursue lighting improvements prior to talking with anyone about the Small Business Lighting Solutions Program?

1. Yes
2. No
9. (Don't know/Don't recall)

Now I would like to ask you to consider what actions you would have taken in the absence of the Small Business Lighting Solutions Program. If your company / organization had not participated in the Small Business Lighting Solutions Program, which of the following actions do you think you would have taken? Please select all that apply. Would you have... **[For FR2a-d 1 = YES, 2 = NO, 9 = Don't know; For FR2c if YES ask FR2ci]**

FR2a. Postponed installing energy efficient lighting by more than one year

FR2b. Would not have installed any energy efficient lighting

FR2c. Would have installed less energy efficiency lighting

FR2ci. [If yes: Would you have installed (i. Slightly, ii. Somewhat, iii. Significantly) less energy efficient lighting?]

FR2d. Would have installed the same amount of energy efficient lighting that was installed through the program

FR3. Nova Scotia Power paid [\$XX- **READ FROM SAMPLE FILE**] of the [\$XX- **READ FROM SAMPLE FILE**] total project cost. If your company had not received the incentive from Nova Scotia Power, could your budget have accommodated the full cost of the project including the incentive? Again, the full cost of the project would have been **[READ FROM SAMPLE FILE]**.

1. Yes
2. No
3. (Don't know)

FR4. How influential were the following elements to your decision to participate in the Small Business Lighting Solutions program? Please give your answer on a scale of 1 to 5, where 1 indicates that the program "had no influence at all on your decision to install the energy efficient lighting" and 5 indicates that the program was "extremely influential to your decision to install the energy efficient lighting." How influential was / were the:

Element (READ)	(a) Performance of Measure					
a. NSPI Incentive	1 no influence	2	3	4	5 extremely influential	9 DK
b. Information received during the initial contact by the program representative	1 no influence	2	3	4	5 extremely influential	9 DK
e. NSPI-funded lighting audit	1 no influence	2	3	4	5 extremely influential	9 DK

SNAP BACK / SNAP FORWARD

20. 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 Lighting 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)

SPILLOVER

21. Now I'd like you to think of the time since you participated in the Small Business Lighting Solutions program. Has your company purchased and installed any additional lighting upgrades on your own for this or other facilities served by Nova Scotia Power?

1. Yes
2. No [Go to Q25]
9. (Don't know [Go to Q25])

22. Were these additional lighting upgrades of the same level or a higher level of efficiency as the lighting you installed through the Small Business Lighting Solutions program?

1. Yes
2. No [Go to Q25]
9. (Don't know [Go to Q25])

23. About what quantity of energy efficient lighting upgrades did your company / organization purchase on its own since participating in this program? Please give your response as a percentage of the quantity of lighting upgrades installed through the program? ____% (Don't know=999)

24. Did your experience with the energy efficient lighting upgrades installed through the Small Business Lighting Solutions program influence your decision to install some or all of these energy efficient lighting upgrades on your own? Please, give your answer on a scale of 1 to 5, where 1 indicates ‘that the program “had no influence at all on your decision to install the energy efficient lighting” and 5 indicates that the program was “extremely influential to your decision to install the energy efficiency lighting.” [record response on scale of 1 to 5, 9 = Don’t know]

25. Has your participation in the Small Business Lighting Solutions Program influenced other (non-lighting) energy efficiency actions that your company / organization has taken?

1. Yes
2. No [Go to Q27]
9. (Don’t know [Go to Q27])

26. What other measures has your company / organization implemented or are currently being pursued?

(Do not read)

- a. ☐ Scoping, feasibility or technical assessments
- b. ☐ Motors
- c. ☐ AC
- d. ☐ Heating
- e. ☐ Insulation
- f. ☐ Windows
- g. ☐ Energy management system or controls
- h. ☐ Behavior changes (e.g. thermostat)
- i. ☐ Air Compression
- j. ☐ Refrigeration
- k. ☐ Other (Specify: _____)

(Go to Q20)

27. (If Q25 = No) What is the most important reason your company / organization has not pursued additional energy efficiency measures at this location? **(Do not read)**

1. (No interest in pursuing other energy efficiency measures)
2. (No time to pursue other energy efficiency measures)
3. (Concern that actual bill savings would less than estimated)
4. (Lack of information to make an informed decision)
5. (Lack of financing)
6. (Energy efficient equipment does not meet payback requirements)
7. (Decision made elsewhere)
8. (Do not own building – have to work through owner)
9. (Other (Specify: _____))
99. (Don’t know/Don’t recall)

28. In number of years or months, how quickly does your company / organization require energy efficiency measures pay for themselves in order for your company / organization to implement a measure—that is, what are your payback requirements? [999 = Don’t know/don’t recall]

—

Section III. Satisfaction with Program & Future Purchase Intentions

29. 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 Lighting Solutions Program? [9=Don't know/Don't recall]

- 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

30. 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 Lighting Solutions Program? [RANDOMIZE 1-15, THEN 16; 9=Don't know/Don't recall]

- 1. ☐ Single point of contact
- 2. ☐ Interaction and communication with contractors
- 3. ☐ Initial contact from contractors
- 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 rebate amount
- 14. ☐ Quality of vendors who provided recommendations
- 15. ☐ Paperwork and procedures required to receive incentives
- 16. ☐ The program overall

31. On a scale of 1 to 5, where 1='not at all likely' and 5='very likely', how likely will your company / 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]

☐

Section IV. Barriers to Action & Recommendations for Improvements

32. Does your company / organization own or lease the space you occupy at this location?

- 1. ☐ Own (Go to Q35)
- 2. ☐ Lease
- 9. (Don't know/Don't recall)

33. Did you have to get permission from the building owner to participate in the Small Business Lighting Solutions Program?

- 1. ☐ Yes
- 2. ☐ No (Go to Q35)
- 9. (Don't know/Don't recall)

34. 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 Lighting Solutions Program? [9=Don't know/Don't recall]

—

35. Were there any challenges or barriers that your company / organization faced in implementing the energy efficiency measures provided through the program?

- 1. ☐ Yes
- 2. ☐ No (Go to Q30)
- 9. (Don't know/Don't recall) (Go to Q30)

36. What was the ONE 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)
- 12. ☐ (Other (Specify: _____))
- 99. (Don't know/Don't recall)

37. What was the second most important barrier? (**Do not read**)

- a. ☐ (Concern that actual bill savings would be less than estimated)
- b. ☐ (Lack of information to make an informed decision)
- c. ☐ (Too little incentive)
- d. ☐ (Too much work required to obtain funding)
- e. ☐ (Too little information about the program)
- f. ☐ (Cost savings not worth the effort of applying)
- g. ☐ (Approval takes too long)
- h. ☐ (Lack of financing)
- i. ☐ (Energy efficient equipment does not meet payback requirements)
- j. ☐ (Decision made elsewhere)
- k. ☐ (Do not own building – have to work through owner)

- l. ___ (Other (Specify: _____))
 99. (Don't know/Don't recall)

38. 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? [9=Don't know/Don't recall]

39. 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? [9=Don't know/Don't recall]

40. What percent of your annual operating budget do energy costs account for? [999= Don't know/Don't recall] ___%

41. Do you have any suggestions on how to improve the Small Business Lighting Solutions Program? Consider all aspects of the program: Process (preliminary audit, feasibility assessment, project implementation, and verification), marketing, interactions with utility staff, interactions with contractors, and program forms.

Section V. Firmographics

42. What is the principal 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.) NOT IN CBECS)
16. ___ Other

17. ☐ Vacant
99. (Don't know/Don't recall)
43. Into which of the following categories does your building floor space fall?
(square meters) (square feet)
- | | | |
|-----------------------------|-------------|---------------|
| 1. ☐ | 93 or less | 1,000 or less |
| 2. ☐ | 93 – 463 | 1,000-4,999 |
| 3. ☐ | 465-929 | 5,000-9,999 |
| 4. ☐ | 930-4645 | 10,000-49,999 |
| 5. ☐ | 4,646-9,290 | 50,000-99,999 |
| 6. ☐ | Over 9,290 | Over 100,000 |
99. (Don't know/Don't Recall)
44. 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 |
9. (Don't know/Don't recall)
45. How many hours per week, on average, is the facility open? [999 = Don't know/Don't recall]
46. Is your company independent, or part of a larger company?
- | | |
|-----------------------------|--------------------------|
| 1. ☐ | Independent |
| 2. ☐ | Part of a larger company |
| 3. ☐ | Don't know |
| 4. ☐ | Refused |
| 5. ☐ | Other (_____) |
9. (Don't know/Don't recall)

Delivery Agent Interview Guide: NSPI SBLS Program

Interviewer:

Date of Interview:

Time Begun: Time Ended:

Respondent Name:

Respondent Title:

Phone Number(s):

Fax Number: _____

E-mail Address:

Hello, my name is _____ from Nexus Market Research and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm has performed work for a Nova Scotia Power customer who participated in the Small Business Lighting Solutions Program offered by Nova Scotia Power. As part of our evaluation we would like to ask you some questions about your role in the SBLS Program, these questions should take about 20-30 minutes. Please be aware that the information you provide will be treated as confidential.

With your permission, I would like to record the interview. We will use the recording for transcription purposes in order to make sure we accurately represent your responses. No one but NMR staff members will listen to the recording. NMR will keep all recordings in its files. Do I have your permission to record the interview ____ Yes ____ No

Background, interaction with staff, role within the program, program marketing, program process, satisfaction

1. Are you the person at [Company Name] who is most knowledgeable about your experiences with the work performed for the SBLS program?
2. What kind of energy services are offered by your company / organization? [PROBE: Audits, implementations, retrofits, etc]
3. What is your current job title? What roles and responsibilities do you have at [Company]?
4. How did you first become aware of the SBLS program?

5. How often do you interact with NSPI SBLS program staff? What types of interactions do you typically have with NSPI staff? [PROBE: status calls, meetings, etc] Could these interactions be improved? How?
6. Have you received any training or information from NSPI that helped you prepare to work with the SBLS Program? IF YES: How effective was this training? IF NO: Do you think you would benefit from any type of training? What type of training do you think would be of benefit to you?
7. How do participants typically become aware of the SBLS program? [PROBE: From NSPI, from contractor, from other customers, etc]
8. What interaction and communication do you engage in with Material Vendors and electrical contractors? Could these interactions be improved? How?

Thinking about your pre-retrofit responsibilities:

9. How do you market the program?
 - a. Do you market the program to all eligible customers or to specific types of customers?
 - b. What marketing methods have you found most effective? Are there any marketing methods that you have found to be ineffective?
10. How do you typically receive referrals from NSPI? How much time passes between receiving a referral and contacting a customer to schedule an audit?
11. What is the average length of an on-site lighting audit?
12. How much time typically passes between the on-site audit and the presentation of cost and savings analysis to the customer?
13. As a percent about how much of this time is spent:
 - a. Preparing the savings analysis?
 - b. Preparing the cost estimates?
 - c. Other functions (SPECIFY)
14. Could the time between the on-site audit and the presentation of cost and savings analysis to the customer be reduced? Why not, or how?
15. How do you typically present the cost and savings analysis to the customer? [PROBE: in person, via email, over the phone, etc]
16. How much time typically passes between the customer receiving the presentation of costs and savings and obtaining the customer authorization signature? Could this time be reduced? Why not, or how?

Now thinking about your responsibilities during and after the retrofit:

17. After a customer has signed their authorization how much time typically passes before the:
 - a. Work is scheduled
 - b. Work is completed
18. What procedures and rules do you have to ensure that:
 - a. You have access to site for retrofit
 - b. Project scope of work is followed
 - c. Jobsite safety is maintained
 - d. Projects are completed on schedule
 - e. Project cost estimates are meet
19. What if any follow-up activities do you or your company engage in with customers after the retrofit work is completed? [PROBE: Who performs the post-installation inspections? If deficiencies are discovered what process is in place to correct these deficiencies and how much time is required before they are corrected?]
20. In what ways has participating in the SBLS program helped your company? [PROBE: increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc.]
21. What, if any, are some of the challenges of working with SBLS? [PROBE: dealing with paperwork, getting business, onerous program processes, etc.]
On a scale of 1 to 10, where 1 = “very satisfied” and 10 = “not at all satisfied” how satisfied are you with the following aspects of the SBLS program:
 22. Energy savings analysis tool provided by NSPI
 23. Program application
 24. Material purchasing process
 25. Authorized vendors
 26. Vendors stocking of lighting products
 27. List of lighting products covered by the program
 28. Project report format provided by NSPI

[FOR ANYTHING RATED A 6 OR LESS]

29. How could this be improved?

Data Tracking

30. How do you record and track the different activities and functions that you perform for SBLS?
Who is responsible for recording the information at each stage? What information is provided to NSPI? In what format is this information provided? How frequently?
PROBE FOR EACH PHASE:
 - a. Direct marketing of program
 - b. On-site lighting audit

- c. Preparation of cost and savings analysis
 - d. Presentation of cost and savings analysis to customer
 - e. Obtaining participant authorization to proceed
 - f. Direct installation of energy efficient lighting upgrades
 - g. Proper disposal of old lighting materials
31. Do you also record and track any other energy efficiency improvements that participating customers may request? This could be energy efficiency improvements that do qualify for SBLS rebates or they could be additional SBLS qualified measures that are installed outside the program?

Participant perceptions

Now I'd like to ask you a few questions about customer perceptions.

32. What do you think motivates customers to participate in the SBLS program? [PROBE: Save energy, rebates offered, reduce maintenance costs, protect environment, recommended by utility, concerns with carbon, etc]
33. Are there any barriers that might prevent customers from participating in the program? [PROBE: lack of information, incentive too small, too much work to apply, do not own building, approval takes too long, etc]
34. Are there any issues or concerns that customers who have participated in the program have expressed? How could these issues or concerns be addressed?

Spillover

Now I'd like to ask you a few questions about the energy efficiency improvements participants may have implemented after participating in the program.

35. Since participating in the SBLS program, have you implemented any other energy efficiency measures for any of the SBLS participants that you worked with? [IF NO SKIP TO FIRMOGRAPHICS]
36. Did participation in the SBLS program influence these participants pursuing additional energy efficiency measures outside of the SBLS program? [IF NO SKIP TO FIRMOGRAPHICS]
37. What types of measures have these customers implemented since participating in the SBLS program?
38. As a percent of the amount of energy saved through the measures customers implemented as part of the SBLS program how much energy do you expect these additional improvements will save? [PROBE: 20% of that installed through the program, 100%, 200%?]

39. Do you have any additional suggestions or comments on how the SBLS program can be improved?

Firmographics

40. Approximately how many full-time equivalent workers are employed by your company/organization?

- 8. ☐ Fewer than 5
- 9. ☐ 5 to 9
- 10. ☐ 10 to 19
- 11. ☐ 20 to 49
- 12. ☐ 50 to 99
- 13. ☐ 100 to 249
- 14. ☐ 250 or More
- 9. ☐ Don't know/Don't recall

41. Is your company independent, or part of a larger company?

- 6. ☐ Independent
- 7. ☐ Part of a larger company
- 8. ☐ Don't know
- 9. ☐ Refused
- 10. ☐ Other (_____)
- 9. ☐ Don't know/Don't recall

Materials Vendor Interview Guide: NSPI SBLS Program

Interviewer:

Date of Interview:

Time Begun: Time Ended:

Respondent Name:

Respondent Title:

Phone Number(s):

Fax Number: _____

E-mail Address:

Hello, my name is _____ from Nexus Market Research and we are performing an evaluation of energy efficiency services provided by Nova Scotia Power. Our records indicate that you or your firm has performed work for a Nova Scotia Power customer who has participated in the Small Business Lighting Solutions Program offered by Nova Scotia Power. As part of our evaluation we would like to ask you some questions about your role in the SBLS Program, these questions should take about 15 minutes. Please be aware that the information you provide will be treated as confidential.

With your permission, I would like to record the interview. We will use the recording for transcription purposes in order to make sure we accurately represent your responses. No one but NMR staff members will listen to the recording. NMR will keep all recordings in its files. Do I have your permission to record the interview ____ Yes ____ No

Background, interaction with staff, role within the program, program marketing, program process, satisfaction

1. Are you the person at [Company Name] who is most knowledgeable about your experiences with the work performed for the SBLS program?
2. What kind of energy-related products and services are offered by your company / organization?
[PROBE: lighting, motors, etc]
3. What is your current job title? What roles and responsibilities do you have at [Company]?
4. How did you first become aware of the SBLS program?
5. How often do you interact with NSPI SBLS program staff? What types of interactions do you typically have with NSPI staff? [PROBE: status calls, meetings, etc] Could these interactions be improved? How?

6. Have you received any training or information from NSPI that helped you prepare to work with the SBLS Program? IF YES: How effective was this training? IF NO: Do you think you would benefit from any type of training? What type of training do you think would be of benefit to you?
7. How do participants typically become aware of the SBLS program? [PROBE: From NSPI, from contractor, from other customers, etc]
8. What interaction and communication do you engage in with Delivery Agents and electrical contractors? Could these interactions be improved?
9. Do you market the program in any way? How? Why or why not?
10. Do you have any issues or concerns with
 - a. Maintaining an adequate stock of the agreed list of lighting products?
 - b. Delivery lighting products to customer sites for delivery agents?
 - c. Providing warranty replacements?
 - d. The agreed list of lighting products? [PROBE: Are there other products that should be on the list? Are there products that should not be on the list?]
11. Are there other incentives or rebates available, not provided by NSPI, for the lighting equipment that is rebated by the SBLS program? What are the incentives? Who offers these incentives? How long have these incentives been in place? How long will they continue? What impact have these incentives had on product sales?
12. In what ways has participating in the SBLS program helped your company? [PROBE: increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc.]
13. After the introduction of the SBLS program, did you experience any increased sales of the equipment that you stock for the SBLS program? By how much did sales increase? Did the increase in sales come only from contractors that are participating in the program (delivery agents, electrical contractors)? Or was there also an increase in sales to non-participating contractors? IF LATTER: Why do you think that happened?
14. What do you think the impact on sales would be if the program were to be discontinued? [PROBE: Decline to pre-program levels, decline but will stay above pre-program levels, will stay the same as during the program] Why do you think that?

On a scale of 1 to 10, where 1 = “not at all satisfied” and 10 = “very satisfied”, how satisfied are you with the following aspects of the SBLS program:

15. Interaction with NSPI staff
16. Assistance provided by NSPI staff
17. Incentive level provided

18. Program paperwork
19. Program delivery process and procedures
20. Availability of information about the program
21. The program overall

[FOR ANYTHING RATED A 6 OR LESS]

22. How could this be improved?

Data tracking

How do you track data on sales of qualified lighting products through the SBLS program?

IF TRACKED: Do you provide this information to NSPI?

- IF YES: In what format is this provided to NSPI and how frequently? Do you also provide information on sales of qualifying products that are sold outside the program?
- IF NOT TRACKED: Why not? How easy will it be to set up your inventory tracking system to identify program sales?

Contractor perceptions

Now I'd like to ask you a few questions about contractor perceptions.

23. What do you think motivates contractors (electrical contractors, delivery agents) to participate in the SBLS program? [PROBE: : increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc]
24. Are there any barriers that might prevent contractors from participating in the program? [PROBE: dealing with paperwork, getting business, onerous program processes, etc]
25. Are there any issues or concerns that contractors who have participated in the program have expressed? How could these issues or concerns be addressed?
26. Do you have any additional suggestions or comments on how the SBLS program can be improved?

Firmographics

27. Approximately how many full-time equivalent workers are employed by your company/organization?

- 15. ☐ Fewer than 5
- 16. ☐ 5 to 9
- 17. ☐ 10 to 19
- 18. ☐ 20 to 49
- 19. ☐ 50 to 99
- 20. ☐ 100 to 249
- 21. ☐ 250 or More
- 9. Don't know/Don't recall

28. Is your company independent, or part of a larger company?

- 11. ☐ Independent
 - 12. ☐ Part of a larger company
 - 13. ☐ Don't know
 - 14. ☐ Refused
 - 15. ☐ Other (_____)
 - 9. Don't know/Don't recall
-

Recycling Contractor Interview Guide: NSPI SBLS Program

Date:

Name:

Organization:

Introduction:

[This interview should take about 15 minutes]

Your comments are confidential. By the way, if I ask you about areas you don't know about, please feel free to tell me and we will move on. For transcription purposes we will be recording this call. Do you have any questions before we start?

Initial Program Background:

42. Are you the person at [Company Name] who is most knowledgeable about your experiences with the work performed for the SBLS program?
43. What is your current job title? What roles and responsibilities do you have at [Company]?
 - a. Approximately how much of your time is devoted to the SBLS program?
44. How did you first become aware of the SBLS program? [PROBE IF NOT MENTIONED: Were you recruited by the SBLS program staff? IF NO: Did you approach SBLS program staff about being their recycling contractor?]
45. What are your responsibilities with regards to the SBLS program?
46. What organizations and individuals do you primarily interact with for this program? What is the nature of these interactions? How frequently are you in contact with them? [PROBE IF NOT MENTIONED:
 - a. How frequently are you in contact with Scott Shepherd, the program manager at Nova Scotia Power? What is the nature of these interactions? Do you interact with the Delivery Agents of the SBLS program? IF YES:
 - b. Do you interact with the Material Vendors of the SBLS program? IF YES: What do these interactions consist of? How frequently are you in contact with them? Could these interactions be improved?
47. What do these interactions consist of? How frequently are you in contact with them? Could these interactions be improved?
48. Have you received any training or information from NSPI that helped you prepare to work with the SBLS Program? IF YES: How effective was this training? IF NO: Do you think you would benefit from any type of training? What type of training do you think would be of benefit to you?
49. Please describe for me the SBLS recycling process starting with when the bulbs are removed from service.
50. Have you had any issues coordinating with the Delivery Agents? [PROBE: what bulbs, at which sites, need to be recycled?]

- a. Does the SBLI program require that all bulbs, replaced through the program, be recycled?
IF NO: Why not? Are there additional incentives available if customers have their old bulbs recycled?
 - b. Does your company recycle the bulbs, or are they sent to a third party to be recycled?
51. IF INCENTIVES ARE AVAILABLE: Are there other incentives available, not provided by NSPI, for recycling light bulbs that are rebated by the program? IF YES: What are the incentives? Who offers the incentives? How long have these incentives been in place? How long will they continue?
52. In what ways has participating in the SBLS program helped your company? [PROBE: increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc.]
53. Do you have other clients, aside from the SBLS program? Since joining the SBLS program, has your company seen an increase in sales? IF YES: By what percent has your business increased?
- a. Do you think your involvement in the SBLS program has helped increase sales? IF YES: In what ways?

Data Tracking

17. Do you track the quantities and types of light bulbs that are recycled through the program? IF YES: Do you provide this information to NSPI?
- a. IF YES: In what format is this provided to NSPI and how frequently?
 - b. IF THEY DO NOT TRACK: Why not?

Contractor Perceptions

Now I'd like to ask you a few questions about contractor perceptions.

18. What do you think motivates contractors (electrical contractors, delivery agents) to participate in the SBLS program? [PROBE: : increased business, improved skill set of staff, assisted with worker training, given them a competitive edge, etc]
19. Are there any barriers that might prevent contractors from participating in the program? [PROBE: dealing with paperwork, getting business, onerous program processes, etc]
20. Are there any issues or concerns that contractors who have participated in the program have expressed? How could these issues or concerns be addressed?
21. Do you have any additional suggestions or comments on how the SBLS program can be improved?

Firmographics

22. Approximately how many full-time equivalent workers are employed by your company/organization?
- 22. ___ Fewer than 5
 - 23. ___ 5 to 9
 - 24. ___ 10 to 19
 - 25. ___ 20 to 49

- 26. ☐ 50 to 99
 - 27. ☐ 100 to 249
 - 28. ☐ 250 or More
 - 29. ☐ Don't know/Don't recall
23. Is your company independent, or part of a larger company?
- 16. ☐ Independent
 - 17. ☐ Part of a larger company
 - 18. ☐ Don't know
 - 19. ☐ Refused
 - 20. ☐ Other (_____)
 - 9. ☐ Don't know/Don't recall