

Efficiency Nova Scotia Corporation

IN THE MATTER OF *The Public Utilities Act*, R.S.N.S. 1989, c.380,
as amended.

- and -

IN THE MATTER OF An Application to Approve Efficiency Nova
Scotia Corporation's Electricity Demand Side Management (DSM) Plan
for 2013-2015.

Evidence of ENSC As DSM Administrator

REVISED
April 18, 2012

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1. INTRODUCTION

This Evidence is in support of an electricity Demand Side Management (DSM) Plan for 2013 to 2015 (2013-2015 DSM Plan), filed with the Nova Scotia Utility and Review Board (UARB) by Efficiency Nova Scotia Corporation (ENSC or the Corporation) in its role as the administrator of electricity DSM programs for Nova Scotia.

Responsibility and accountability for the administration of DSM programs were transferred from Nova Scotia Power Inc. (NSPI) to ENSC effective October 1, 2010, with transfer of operational activities phased in during the fall of 2010. The transition was completed by December 31, 2010. NSPI and ENSC continue to work closely in the areas of effective program delivery, data sharing, customer communication and the coordination of planning and forecasting.

ENSC submitted its first DSM Plan filing, the 2012 DSM Plan, on February 28, 2011, which was approved by the UARB on June 30, 2011. Throughout 2011, ENSC delivered DSM programs and services, in accordance with the 2011 DSM Plan, which was filed by NSPI on February 26, 2010 and approved (as amended) by the UARB on July 27, 2010.

In accordance with the June 30, 2011 UARB Order, ENSC filed:

- its response to the recommendations of the 2010 DSM Evaluation and Verification Reports, on July 29, 2011
- its Cost Allocation Methodology, to separately account for ENSC's costs related to electricity and other fuels mandates, on September 30, 2011
- its DSM Net-to-Gross Evaluation Methodology Report (referred to in the UARB Order as the free ridership and spillover study), on December 15, 2011

1 The June 30, 2011 UARB Order also directed ENSC to:

- 2
- 3 • engage stakeholders regarding changes to the Program Development
- 4 Working Group (PDWG) or the creation of a new stakeholder process –
- 5 (this is addressed in Section 1.2)
- 6 • meet with UARB staff and consultants on a quarterly basis to review
- 7 progress on program implementation, program expenditures and
- 8 achievement of the targeted energy and demand savings – (this began in
- 9 the fall of 2011 with a meeting on progress to the end of Q3)
- 10 • provide enhanced information on rate and bill impacts in connection with
- 11 the 2013 DSM Plan – (this is addressed in Section 5)
- 12

13 On December 19, 2011, the UARB ordered ENSC to lead the review of the cost
14 allocation methodology in consultation with stakeholders and file its proposed
15 methodology coincident with the filing of its 2013 DSM Plan. This is addressed in
16 Section 5.

17

18 In a letter from the UARB to ENSC, dated January 9, 2012, ENSC was directed, as part
19 of its 2013 DSM Plan filing, to address three issues arising from Dr. Peach's review of
20 ENSC's Report on 2010 Evaluation and Verification Action Items (filed July 20, 2011)
21 and ENSC's subsequent responses to Information Requests (filed November 18, 2011).
22 The issues are: the safe disposal of CFLs; leveraging sources of financing; and the
23 development of a dual baseline approach for savings evaluations. These issues are
24 discussed in Section 6.

25

26 Through an open and competitive request for proposals process, ENSC retained Econoler
27 Inc. to perform process and impact evaluations of the 2011 DSM portfolio of programs.
28 The results of the evaluation are filed separately.

1.1 Development of the 2013-2015 DSM Plan

To aid in the preparation of the 2013-2015 DSM Plan, ENSC retained the advice and assistance of Navigant, Dunskey Energy Consulting (Dunskey) and Elenchus Research Associates Inc. (Elenchus). ENSC also received input and counsel from DSM stakeholders, and drew from its experiences delivering the 2011 DSM Plan. ENSC's Board of Directors has actively engaged with ENSC's senior management and consultants Navigant, Dunskey and Elenchus in the development of this Plan and has formally approved its submission to the UARB.

ENSC is committed to broad, transparent and effective stakeholder consultation. On November 3, 2011, ENSC hosted a full-day DSM consultation session for stakeholders. ENSC provided an update on its 2011 DSM programs and pilots. Dunskey and Navigant gave presentations on a potential regulatory framework and on multi-year DSM planning. These presentations were directional in nature, engaging stakeholders in a discussion of the key drivers for multi-year DSM planning and notional multi-year DSM target levels. Elenchus led a discussion on the accounting of ENSC costs between electric rate-payer-funded DSM services and those funded by the provincial government for other fuel types. Elenchus also discussed the cost allocation methodology for allocating ENSC's electricity DSM costs among electricity rate classes.

A second stakeholder consultation session was held on December 8, 2011. The meeting included presentations and further discussions on the elements of a multi-year DSM framework and the approximate energy savings targets over the multi-year horizon. There was also further discussion on potential revisions to the methodology for allocating DSM costs among electricity rate classes.

Before or after the second session, ENSC had informal, individual discussions with representatives from the Ecology Action Centre, the Affordable Energy Coalition, the Consumer Advocate, the Small Business Advocate, the Large Industrial sector and the

1 Extra-Large Industrial sector.

2
3 **1.2 DSM Advisory Group**
4

5 The PDWG has proven to be a valuable resource and stakeholder forum. It has provided
6 advice and guidance on the design and implementation of DSM programs, beginning
7 with the development of the 2008-09 DSM Plan by NSPI and continuing through the
8 transition of DSM administrator responsibilities to ENSC in 2010.
9

10 A continuation of the PDWG was supported by stakeholders during the UARB hearings
11 for the 2011 and 2012 DSM Plans. In its 2012 DSM Plan filing, ENSC stated that it
12 would engage the PDWG and stakeholders on necessary changes to the PDWG or the
13 creation of a new stakeholder process. The UARB directed ENSC to file the results of its
14 review as part of the 2013 DSM Plan.
15

16 The role, composition and structure of an ongoing DSM stakeholder group was discussed
17 at the July 21, 2011 PDWG meeting and again on September 21, 2011. These discussions
18 were continued at the November 14, 2011 meeting and the group reached agreement on a
19 re-focused role and expanded membership of the newly named DSM Advisory Group.
20

21 Whereas the PDWG provided guidance on operational matters involving the development
22 and implementation of ENSC programs and ongoing modifications, the role of the DSM
23 Advisory Group is to provide directional advice and stakeholder perspectives on
24 emerging issues.

One representative from each of the Large Industrial sector, the Nova Scotia Department of Energy and the Small Business Advocate has been invited to join the DSM Advisory Group. With ENSC as the chair and host, the invited membership of the DSM Advisory Group is as follows:

- Consumer Advocate
- Ecology Action Centre
- Extra-Large Industrial Sector
- Halifax Regional Municipality
- Large Industrial Sector
- Municipal Electric Utilities
- Nova Scotia Department of Energy
- NSPI
- Small Business Advocate
- UARB

1.3 Public Engagement

ENSC recognizes that many Nova Scotians have little knowledge of the value of and opportunities provided by DSM. With that in mind, ENSC's Board of Directors has emphasized the need to engage Nova Scotians more broadly in building awareness, in education, and ultimately in changing behaviour regarding energy efficiency.

In 2011, the Corporation sought to reach a broad base of Nova Scotians who are typically not actively engaged in the regulatory process for electricity DSM. ENSC staff developed relationships with groups such as local chambers of commerce, school boards, and associations such as the Building Owners and Managers Association, the Canadian Federation of Independent Business, Canadian Manufacturers and Exporters, the Nova Scotia Home Builders' Association, commercial developers, public housing authorities, the Investment Property Owners Association and the Union of Nova Scotia Municipalities, among others. Critical to building these

1 relationships is the mutual exchange of information and feedback.

2
3 ENSC also engaged Nova Scotians through traditional means such as op-ed pieces in
4 newspapers, stories in the media, appearances at trade shows, conferences and speaking
5 engagements throughout the province. As well, the “Take Charge!” speaking tour, featuring
6 journalist Silver Donald Cameron, began in 2011. The tour ultimately visited nine communities,
7 engaging participants and creating significant media coverage on how energy efficiency “saves
8 money, creates jobs and helps the planet.” The Corporation also used other non-traditional means
9 to reach out and engage Nova Scotians through social media, including promotions on its
10 website, Facebook and Twitter.

2. 2011 DSM RESULTS

2.1 2011 Energy Savings Achieved

In its July 27, 2010 Decision¹, the UARB approved the 2011 DSM Plan, filed by NSPI, to achieve an energy savings target of 158.5 GWh at an expenditure of up to \$41.9 million.

Figure 2.1 shows the evaluated savings results for 2011. The results are subject to final verification by the UARB's savings verification consultant.

Figure 2.1 - 2011 Evaluated Savings Results

	Energy		Demand	
	Target (GWh)	Result (GWh)	Target (MW)	Result (MW)
ENSC DSM Programs	158.5	141.8	30.9	28.9
Adjustment to ELI Savings^a	-	74.2	-	5.8
Total	158.5	216.0	30.9	34.7

^a in addition to the 80 GWh and 12 MW reported in the 2012 DSM Plan

Adjustment to Savings from Extra-Large Industrial (ELI) Projects

In its 2012 DSM Plan filed in February 2011, ENSC recorded 80 GWh of energy savings and 12MW of demand savings from energy efficiency projects completed by the ELI class of customers. These values were conservative preliminary estimates at the time of filing and subject to a more detailed evaluation in 2011. ENSC retained Energy Performance Services (EPS/Canada) Inc. to perform an analysis of the ELI savings; the EPS report is included as Appendix D. Econoler subsequently evaluated the ELI savings

¹ [2010] NSUARB 155.

1 as part of its evaluation of 2011 DSM Programs; the results are documented in the 2011
2 DSM Evaluation Report filed separately.

3
4 The evaluated results for the ELI projects are: 154.2 GWh of energy savings, compared
5 to 80.0 GWh (preliminary value), resulting in an adjustment of +74.2 GWh; and 17.8
6 MW of demand savings, compared to 12.0 MW (preliminary value), resulting in an
7 adjustment of +5.8 MW.

9 **2.2 2011 DSM Expenditures and Energy Savings Results**

10
11 The UARB approved an expenditure of up to \$41.9 million for the 2011 DSM Plan. The
12 2011 DSM energy savings were achieved with an expenditure of \$35.8 million, based on
13 unaudited financial results for the year ended December 31, 2011.

14
15 Expenditures and evaluated energy savings results by program are provided in Figure 2.2.

1

Figure 2.2 - 2011 DSM Plan Expenditures and Evaluated Energy Savings

	Expenditures (Unaudited) (\$ million)	Evaluated Energy Savings (GWh)	Evaluated Demand Savings (MW)
Residential			
Efficient Products ^a	11.20	49.4	8.9
Existing Homes ^b	2.13	6.4	2.3
Low Income ^c	4.98	12.4	2.7
New Homes	1.40	2.5	0.9
Commercial and Industrial			
Prescriptive Rebate	2.97	15.0	3.5
Custom	3.69	32.9	3.8
Small Business Direct Install	6.46	23.2	6.8
Multi-sector			
Education and Outreach	0.86		
Development and Research	1.42		
ENSC Startup	0.68		
Total	35.79	141.8	28.9

Columns may not add correctly due to rounding.

^a not including Low Income Renter

^b including Fuel Substitution

^c including Low Income Renter

2.3 2011 DSM Programs

In its first full year of operation, ENSC built awareness as the new place for Nova Scotians to go for energy efficiency solutions, largely through the promotion of its programs, advertising, media opportunities and outreach, reinforcing the value of efficiency. Central to these efforts was the creation of a strong, interactive presence online. ENSC's website, Facebook page, and Twitter and YouTube accounts all reflect its efforts to reach Nova Scotians who are using social media to get the information they need, as quickly and conveniently as possible.

To further enhance accessibility in 2011, ENSC provided more opportunities for low- and modest-income homeowners, renters, and residents of multi-family dwellings to participate in ENSC's DSM programs and save energy. For the first time, the Low Income program exceeded its annual target, achieving 12.4 GWh of energy savings compared to a target of 9.08 GWh², with an investment of \$4.98 million; while assisting 10,023 homeowners and renters.

Renters are now able to qualify for and receive the benefits of ENSC's programs. In 2011, 4920 income-qualified renters received free direct-install upgrades of low-cost efficiency measures including the replacement of incandescent bulbs, installing low-flow showerheads and faucet aerators, and wrapping water pipes and hot water tanks.

ENSC also modified its program so that more low- and modest-income homeowners may now receive free direct-install upgrades; in 2011, 4,292 homeowners received direct-install upgrades to help them save on average 950 kWh per household. Performing the direct-install upgrades has also proved successful in encouraging homeowners to take advantage of other programs. While onsite, ENSC's direct install agents may identify additional opportunities for the homeowner to save energy through building envelope

² Includes Low Income Homeowners and Low Income Renters

1 upgrades or appliance retirement. If so, ENSC follows up with those who are eligible, to
2 inform them about the Low Income, EnerGuide or Appliance Retirement programs.

3
4 In 2011, ENSC engaged the youth and other band members of a First Nations community
5 to directly install energy savings measures in 171 homes. In this project, several young
6 people received training on energy efficiency and skills training on direct installation.
7 They delivered energy savings to the members of their community by engaging
8 participants and installing the energy efficiency measures.

9
10 Two pilots launched in 2011 helped increase awareness of energy efficiency among Nova
11 Scotians. The Green Schools program was piloted at 16 schools across the province,
12 where students, parents, teachers, and custodial staff put energy efficiency to work in
13 their own schools. The Demonstration Homes pilot engaged homebuilders, homeowners,
14 community college students and the public at large, showing that leading-edge energy
15 efficiency is accessible, affordable and worthwhile and happening within our province.
16 Over a ten-week period, 5,500 people toured the two demonstration homes, which were
17 designed and built for the pilot and are two of the most efficient homes ever built in Nova
18 Scotia. More information is provided in Appendices H and I.

19
20 The fuel substitution pilot, launched in April 2011, displaced electric heat with heat from
21 wood/pellet and natural gas sources in 296 homes. The success of the pilot and the
22 experience gained has contributed to the development of a green heating systems
23 initiative. The 2011 fuel substitution pilot is described in Appendix G, and ENSC's green
24 heating systems initiative is described in Dunsky's report attached as Appendix E.

25
26 Planning and implementation activities are underway for the Home Energy Report pilot
27 program, which is expected to launch in mid-2012. A vendor was selected in September
28 2011 through a competitive process, with the first phase targeting delivery of reports to
29 60,000 residential accountholders. The experience gained in the first year of the program
30 will guide the planning of future phases.

1
2 The Small Business Energy Solutions program completed lighting retrofits for 1468
3 customers in 2011, compared to 801 in 2010. Delivery agents have continued to build
4 capacity, and a number of non-lighting measures are being added for planned
5 implementation in 2012.

6
7 Through the Efficient Products program, CFLs and LED exit-sign lamps were installed
8 for 4,595 businesses, non-profit and institutional customers in 2011. Additional efforts
9 included a successful LED lighting pilot for applications not suited to CFL upgrades such
10 as incandescent and halogen lamps in retail displays.

11
12 The Custom program continues to have strong participation from commercial, industrial
13 and institutional customers. Program enhancements were launched in 2011 for
14 compressed air system upgrades, retro-commissioning, and energy management
15 information systems.

16
17 The Prescriptive Rebates program has been enhanced to include a wider selection of
18 products, upstream rebates and a “Preferred Partner” trade ally strategy, which are
19 expected to result in higher savings in 2012.

20
21 In 2011, ENSC targeted outreach to segments such as auto dealers, multi-unit residential
22 building owners, governments, grocery stores and ice rinks. An “Embedded Energy
23 Manager” program was successfully piloted in 2011 and will continue, facilitating
24 dedicated support for large customers to coordinate their participation in ENSC’s
25 programs. Three account managers and a marketing specialist are now in place.

3. MULTI-YEAR PLANNING

In its 2012 DSM Plan filing, ENSC indicated its intent to engage stakeholders in consultation and dialogue to further assess the available options for the implementation of a future multi-year regulatory model. Such a model would still provide cost-recovery rates to pay for DSM investment and would also allow greater flexibility and capacity in the delivery of DSM programming.

ENSC engaged Dunskey to review the current regulatory oversight model and propose changes to improve ENSC's ability to assist Nova Scotians in saving energy as efficiently and effectively as possible. Dunskey consulted with ENSC's Board of Directors and senior management, as well as DSM program administrators in other jurisdictions. Dunskey further consulted with ENSC's stakeholders during the ENSC-led stakeholder consultation sessions on November 3, 2011 and December 8, 2011. Dunskey's report and recommendations are attached as Appendix B.

Dunskey's review identified a number of strengths from which ENSC benefits, and which form a solid foundation for performance. These include the open and transparent communication between ENSC and its stakeholders, the organization's clarity of purpose, a growing degree of operational flexibility allowed by the UARB and stakeholders, and the meaningful budgets that allow ENSC to hold some sway in the market.

Dunskey noted that the limited (twelve month) approval period of ENSC's plans creates uncertainty in the market. ENSC is unable to make a commitment longer than one year to its contractors (who must decide whether, and to what extent, to invest in building capacity in Nova Scotia), to critical market players (including those who are being asked to provide new products and services to Nova Scotians), to its current and prospective staff, and to its larger customers (who often plan important investments in equipment and buildings over several years). The one-year approval period can further lead to missed savings, as well as diverted organizational time and focus.

ENSC is seeking approval to adopt the recommended approach contained in Dunsky's report (Appendix B). The key components are summarized below.

3.1 Multi-year Planning Cycle

ENSC has prepared a multi-year DSM Plan for UARB approval, subject to a full-scale regulatory hearing. The Plan contains the following:

- the approach it intends to take to achieve savings within its target markets
- a forecast of annual costs (budgets) and energy savings for each of the three years
- a high-level evaluation plan indicating when and how evaluation activities would be conducted, and a timetable for reporting the results

In addition, the multi-year filing includes two additional years of DSM outlook, intended for directional information purposes, not for UARB approval. This rolling approach is designed to keep the period between formal plan approvals relatively short for the UARB and stakeholders, while allowing ENSC, its delivery agents, and trade allies to operate with a multi-year view that enables capacity building for continued future success.

3.2 Annual Progress Reports

Beginning in 2013, and in each intervening year between multi-year filings, ENSC will file an annual progress report in the first quarter of the calendar year, intended to be a paper filing and consisting of:

- a summary of the context, activities and milestones achieved in the prior year

- a management discussion and analysis of any major discrepancies relative to the original plan's intent and forecasts
- a summary of costs and savings for each program or target market area

Dunskey recommends, and ENSC concurs, that the UARB consider adopting a trigger mechanism whereby, if reported results fall below 75 percent of the original plan's forecast savings up to that point, ENSC would be required to file a corrective action plan designed to achieve the total approved energy savings target, within the approved multi-year budget.

3.3 Evaluation

Revisions to the schedule and approach for evaluating DSM program savings are also proposed, changing from an all-in-one annual process to an ongoing multi-year process.

The revised approach provides more timely information to facilitate program adjustments, focuses resources more strategically and cost-effectively, and strengthens the validity of results in the long-term. The proposed approach is comprised of ongoing tracking (as is currently the case); ongoing, "rapid-fire" free ridership surveys of a number of programs and activities that are suitable for this approach; annual spillover surveys conducted the year after participants have been involved in programs; and a rolling schedule of full-scale evaluations, including verification activities, measurement and/or billing analysis, as appropriate, and ex-post spillover surveys. Reporting to program managers, contractors, stakeholders and the UARB would be as follows:

- quarterly reports consisting of preliminary net-to-gross (NTG) values, based on a combination of tracked data, initial NTG estimates and updated free ridership results from quarterly surveys
- a first-year progress report containing the results of more comprehensive evaluations of the program areas selected for full-scale evaluation

- subsequent annual reports providing further adjustments to previously reported values within the multi-year plan timeframe, as the results of additional evaluations, including spillover surveys, are available

3.4 Quarterly Meetings and Reports

ENSC recommends that it continue to meet quarterly with the UARB. Regular meetings with the DSM Advisory Group will provide ongoing opportunities to update stakeholders and discuss issues and concerns. The meetings and reports will provide quarterly status updates and highlights, as well as communicate course changes within the approved DSM Plan.

4. 2013-2015 DSM PLAN

4.1 Summary

ENSC's 2013-2015 DSM Plan, presented in Appendix A, is a multi-year plan, which identifies proposed DSM programs, services, and strategies, and annual investment and energy savings targets, for 2013, 2014 and 2015. The plan builds on experience to date delivering DSM in Nova Scotia and is a continuation of enabling strategies introduced in the 2012 DSM Plan to achieve long-term energy savings for Nova Scotians.

Notable in the Plan are changes to the way ENSC delivers customer services in the future, moving to a one-window approach that puts the customers first and does not expect them to know which ENSC programs might suit them. Instead, a customer-focused approach allows Nova Scotians to simply connect with ENSC and let the Corporation's staff provide a personalized energy solution for each customer. The strategy also recognizes that offering a wide variety of programs (where names, details, or entire offerings may be altered or discontinued over time) can be confusing and frustrating to customers – and ultimately lead to less participation than expected.

ENSC recognizes that, in the long term, the energy efficiency and conservation business is about changing the energy culture in Nova Scotia. Public information, education and awareness are required to build increasing support for this cultural shift. It is essential however, to more directly engage with individual Nova Scotians in ways that help them to understand the relevance of energy efficiency and conservation to their interests and that contribute to their adoption of energy efficiency and conservation as an individual and social norm. In addition, ENSC will be working to build a community-based social marketing dimension across its programs to help to ensure that all programs, including those based largely on incentives, contribute not only to immediate reductions in energy use but also to behaviours that both sustain those energy savings and that also lead to the avoidance of energy waste in the longer term. Education and outreach have been integral

components of electricity DSM plans since 2008, and the emphasis on communications activities will continue to grow.

4.2 Energy Savings and Investment

Figure 4.1 provides a summary of the energy savings and investment for the 2013-2015 DSM Plan and an additional two years of outlook to 2017. Projected savings from the adoption of energy efficiency codes and standards are not included in the DSM Plan and are presented separately in Figure 4.6.

Figure 4.1 - 2013-2015 DSM Plan Savings and Investment including Outlook to 2017

Year	Investment (\$ million)	Lifetime Benefits (\$ million) ^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC) ^b	Program Administrator Cost Test (PAC) ^c
2013	46.2	103.6	135.2	25.9	1.6	2.2
2014	47.7	116.0	137.8	27.0	1.7	2.4
2015	50.4	124.8	137.8	27.0	1.7	2.5
2016	53.9	134.3	139.9	27.6	1.7	2.5
2017	55.1	142.6	141.7	28.0	1.7	2.6
Total	253.3	621.2	692.4	135.4	-	-

Currency is expressed in 2013 dollars. Columns may not add correctly, due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

Figures 4.2, 4.3, and 4.4 provide the program level savings and investment for 2013, 2014, and 2015 respectively.

Figure 4.2 - 2013 DSM Plan Savings and Investment

2013	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	4.0	8.4	18.1	2.8	1.6	2.1
Existing Residential ^d	8.7	14.8	14.3	3.5	1.1	1.7
New Residential	5.5	8.3	5.8	1.5	1.2	1.5
Energy Savings Actions ^d	1.0	1.0	15.0	3.5	1.0	1.0
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	8.1	25.0	30.3	5.2	2.0	3.1
Custom Incentives	9.5	36.4	40.3	7.4	2.1	3.8
Direct Installation	4.6	9.7	11.4	2.0	1.7	2.1
ENABLING STRATEGIES						
Education and Outreach	2.5	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	1.0	-	-	-	-	-
Total	46.2	103.6	135.2	25.9	1.6	2.2

Currency is expressed in 2013 dollars. Columns may not add correctly, due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

1

Figure 4.3 - 2014 DSM Plan Savings and Investment

2014	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	4.2	10.0	19.3	3.1	1.9	2.4
Existing Residential ^d	10.4	20.0	16.9	4.2	1.2	1.9
New Residential	6.6	10.4	6.8	1.8	1.3	1.6
Energy Savings Actions ^d	1.0	1.0	15.0	3.5	1.0	1.0
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	8.0	28.4	31.2	5.5	2.4	3.6
Custom Incentives	9.1	38.4	40.3	7.4	2.3	4.2
Direct Installation	3.5	7.8	8.4	1.5	1.8	2.2
ENABLING STRATEGIES						
Education and Outreach	2.7	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	1.0	-	-	-	-	-
Total	47.7	116.0	137.8	27.0	1.7	2.4

Currency is expressed in 2013 dollars. Columns may not add correctly, due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

1

Figure 4.4 - 2015 DSM Plan Savings and Investment

2015	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	5.0	13.0	22.2	3.6	1.8	2.6
Existing Residential ^d	11.5	24.5	18.9	4.8	1.2	2.1
New Residential	7.9	13.1	8.1	2.1	1.4	1.7
Energy Savings Actions ^d	1.0	1.6	15.0	3.5	1.6	1.6
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	7.6	26.8	28.3	4.9	2.4	3.5
Custom Incentives	9.2	39.0	38.8	7.0	2.3	4.2
Direct Installation	2.9	6.8	6.6	1.1	1.9	2.3
ENABLING STRATEGIES						
Education and Outreach	2.9	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	0.9	-	-	-	-	-
Total	50.4	124.8	137.8	27.0	1.7	2.5

Currency is expressed in 2013 dollars. Columns may not add correctly, due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

Savings from Codes and Standards

In addition to savings resulting from the 2013-2015 DSM Plan, ENSC is forecasting energy savings attributed to the adoption of new energy efficiency codes and standards as provided in Figure 4.6. ENSC's strategy to support and influence the development and adoption of codes and standards is important for achieving long-term energy savings in Nova Scotia. Appendix A contains additional information about specific codes and standards initiatives.

Figure 4.6 - Estimated Savings from Codes and Standards 2013-2017

	Incremental Annual Savings										
Savings Area	2013		2014		2015		2016		2017		Notes
	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	
Residential new construction ¹	2.8	0.7	2.8	0.7	2.8	0.7	2.8	0.7	2.9	0.7	2010 code (adopted)
General-service lighting	0.0	0.0	3.3	0.4	8.8	1.0	5.7	0.6	1.0	0.1	2014 federal standard
Linear fluorescent lighting	12.7	2.0	14.4	2.2	16.1	2.5	17.0	2.6	17.0	2.6	2012 NS standard
Non-residential new construction	0.0	0.0	6.0	0.3	12.5	0.5	13.1	0.6	13.6	0.6	2013 NS code
LED street lights	4.0	1.0	4.0	1.0	4.0	1.0	4.0	1.0	4.0	1.0	2013 NS standard
Total	19.5	3.7	30.5	4.6	44.2	5.7	42.6	5.5	38.5	5.0	

¹These savings are revised from an initial multi-year forecast with incremental savings of between 10 and 12 GWh each year, reported in ENSC's response dated March 29, 2011 to Multeese IR-6. The changes are the result of a revised baseline of Energuide 78 for residential new construction. Information is provided in ENSC's 2011 Evaluation Report.

4.3 DSM Targets

ENSC affirms that the overall purpose of electricity DSM in Nova Scotia is to help meet the province's long-term electricity needs through conservation and energy efficiency as a lower-cost alternative to new supply.

As such, ENSC has stated that one of its primary goals is to meet IRP targets. To date, electricity DSM in Nova Scotia has been successful in meeting the energy savings targets of the 2009 IRP Update.

For reference, the DSM targets for 2008-2017, as set out in the 2009 IRP Update³, are presented in Figure 4.7.

Figure 4.7 - DSM Targets 2008-2017 (from 2009 IRP Update)⁴

Year	Incremental Demand Savings (MW)	Cumulative Demand Savings (MW)	Incremental Energy Savings (GWh)	Cumulative Energy Savings (GWh)	Incremental Program Cost (\$ millions)	Cumulative Program Cost (\$ millions)
2008 ^a	2	2	16	16	3	3
2009 ^a	7	9	50	66	10	13
2010 ^b	17	26	83	149	23	36
2011 ^b	31	57	146	295	41	77
2012 ^b	44	101	205	500	61	137
2013^b	63	164	305	805	82	219
2014^b	57	222	276	1081	74	293
2015^b	57	279	276	1357	74	367
2016 ^b	57	336	276	1632	74	442
2017 ^b	56	392	268	1901	75	516

Numbers are rounded.

^a (expressed in 2008 dollars)

^b (expressed in 2010 dollars)

³ [NSUARB-NSPI-P-884]– 2009 Integrated Resource Plan (IRP) Update Report (November 30, 2009)

⁴ *Supra*, Note 3, Appendix D, Attachment 4, page 1.

With the 2013-2015 DSM Plan and continuing through 2017, DSM planned savings will be below the annual and cumulative targets of the 2009 IRP Update. Figure 4.8 compares cumulative savings targets from the 2009 IRP Update with the actual and expected savings results for 2008-2017.⁵

Figure 4.8 - Cumulative Savings Targets and Results 2008-2017

Year	IRP Target (GWh)	Result (GWh)	IRP Target (MW)	Result (MW)
2008 ^a	16	21	2	5
2009 ^a	66	86	9	15
2010 ^a	149	168	26	31
2011 ^b	295	384	57	65
2012 ^c	500	618	101	109
2013 ^d	805	773	164	139
2014 ^d	1081	941	222	170
2015 ^d	1357	1123	279	203
2016 ^e	1632	1306	336	236
2017 ^e	1901	1486	392	269

^a verified results

^b verified results and includes savings outside DSM programs

^c estimate based on approved Plan and includes savings outside DSM programs

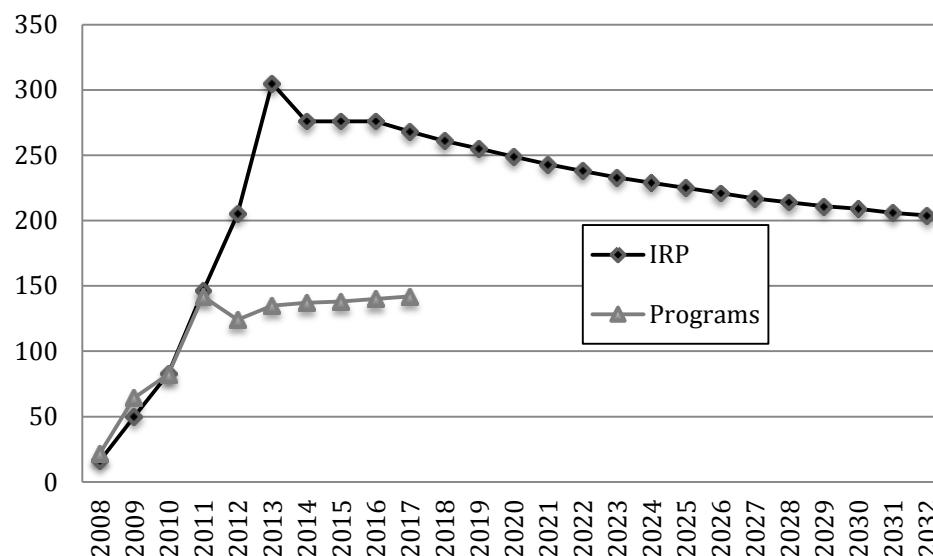
^d estimate based on proposed Plan and includes savings outside DSM programs

^e estimate based on outlook beyond proposed Plan and includes savings outside DSM programs (from the adoption of new codes and standards)

⁵ It does not include adjustments that would arise through the potential adoption of a dual baseline evaluation approach, which is discussed in Section 6.3.

Figure 4.9 shows the DSM savings results and targets compared to IRP targets for 2008-2017.

Figure 4.9 - Incremental Annual Energy Savings from ENSC DSM Programs (GWh)



The 2007 IRP set aggressive targets and a steep ramp-up from 2008 through 2013 for DSM in Nova Scotia. The targets were more than double the DSM achievements of leading North American jurisdictions at the time. In establishing these targets, the 2007 IRP acknowledged stakeholder issues raised during the development of the IRP concerning DSM investment levels and implementation issues. The 2007 IRP also pointed out the importance of testing energy and demand savings projected in the IRP as the DSM program progressed. It stated that “Whether the forecast level of savings can be achieved at the projected cost in Nova Scotia will not be known until specific initiatives are undertaken and the foundation for a comprehensive DSM program is established and

1 monitored.”⁶

2
3 The 2009 IRP Update, which was coincident with the first full year of DSM
4 implementation, made no adjustments to the DSM targets established in 2007.

5
6 ENSC has a role in forecasting, tracking and recording substantive electricity savings
7 realized outside DSM programs. Savings from energy efficiency projects completed by
8 the Extra-Large Industrial class of customers were identified in ENSC’s February 2011
9 filing of the 2012 DSM Plan. These projects were subsequently evaluated in 2011, and
10 have made a major contribution (154.2 GWh) to tracked energy savings.

11
12 In the absence of additional substantial energy savings occurring outside ENSC DSM
13 programs, and without a significant increase in investment by electricity ratepayers, the
14 energy savings in the 2013-2015 DSM Plan from ENSC programs cannot meet the
15 targets in the 2009 IRP Update.

16
17 This Plan proposes a multi-year model with the appropriate levels of DSM savings and
18 investment to achieve desired long-term sustainable energy savings for Nova Scotia to
19 restrain the need for currently projected future supply, and illustrates that revisions to
20 DSM targets in the 2009 IRP Update are now warranted.

21
22 In advance of an expected IRP update, ENSC has shared its five-year DSM target
23 projection with NSPI to test for impact against the 2009 IRP Update. NSPI has indicated
24 that, based on its preliminary review, ENSC’s five-year DSM target projection is within
25 range of the load sensitivities evaluated in the 2009 IRP Update.

⁶ Integrated Resource Plan (IRP) Report, Volume 1: Nova Scotia Power Inc. (July 2007), at pp 35-36.

2013-2015 Savings and Investment

In 2012, ENSC has more experience with DSM in Nova Scotia, which is reflected in the 2013-2015 savings forecast. ENSC's 2013-2015 DSM Plan considers:

- DSM program achievements to date
- the saturation of low-cost CFL measures
- the importance of building a culture of energy efficiency for sustained energy savings
- energy efficiency service capacity in Nova Scotia

DSM program achievements to date have benefitted greatly from the availability of substantial, low-cost energy savings from CFL measures. Pursuit of these energy savings was both appropriate and effective from 2008 to 2011; 40 percent of the DSM program energy savings to date have come from CFL measures.

A study conducted in 2011 for ENSC by Corporate Research Associates Inc. (CRA) and included in Appendix F shows that the opportunity to achieve additional savings from installing CFLs is significantly diminished. Approximately half of all sockets in the residential sector contain CFLs, and the average home in Nova Scotia has 16 CFLs installed. Installing more CFLs will achieve ever-decreasing per-unit savings, because the sockets remaining to be treated are typically those with the lowest usage. Low-cost, easily installed CFL measures will no longer be a cost-effective way to achieve energy savings.

ENSC recognizes the need to build a culture of energy efficiency in Nova Scotia that encourages all Nova Scotians to continue to implement new ways of saving energy. ENSC acknowledges that DSM in Nova Scotia is in the early stages of development compared to other jurisdictions with well-established DSM services spanning decades. To encourage Nova Scotians' participation and to ultimately help change behaviour around energy efficiency, the Corporation is committed to education and outreach, with a

1 growing emphasis on a more community-based approach to social marketing and
2 awareness building, using research, insights and feedback from staff, customers,
3 stakeholders and trade allies, best practices from other jurisdictions and home-grown
4 innovation.

5
6 An evolution to a one-window customer service approach will help optimize saving
7 opportunities for Nova Scotians. Such an approach will allow the Corporation to provide
8 individualized energy solutions to customers, rather than putting the onus on customers to
9 have detailed knowledge of which program(s) might work best for them. As well, ENSC
10 will continue to advocate and promote the adoption of more energy efficient codes and
11 standards that will increase long-term savings across the province.

12
13 ENSC is also developing and sustaining relationships with trade allies, to facilitate the
14 building of a strong energy efficiency industry in Nova Scotia. Trade allies have an
15 increasingly important role in assisting ENSC to stimulate increased demand for DSM
16 services and deliver a broader range of cost-effective, energy saving products and
17 services.

5. COST ALLOCATION, RATE AND BILL IMPACTS

ENSC's 2012 DSM Plan included a preliminary program cost allocation for allocating electricity DSM costs to NSPI ratepayers in accordance with the DSM Cost Allocation Approach Settlement Agreement approved by the Board on August 4, 2009 for the years 2010, 2011 and 2012. On December 19, 2011, the Board ordered ENSC to lead the review of the cost allocation methodology in consultation with stakeholders and file its proposed methodology coincident with the filing of its 2013 DSM Plan.

On June 30, 2011, the Board ordered ENSC to develop and file, no later than September 30, 2011, its policy to track time and costs for electric and other fuel mandates. The June 30, 2011 Board Order also directed ENSC to undertake the necessary consultation to provide enhanced information on rate and bill impacts in future proceedings.

In response to the above UARB Orders, ENSC retained Elenchus to:

- assist in developing a cost allocation model (CAM) to fully allocate ENSC costs to taxpayer-funded programs and ratepayer-funded programs
- lead the review, in consultation with stakeholders, of the DSM cost allocation approach for allocating ENSC DSM costs to electricity ratepayer classes, to be considered for implementation for the 2013-2015 DSM Plan years
- prepare the preliminary program cost allocation tables for filing with the 2013-2015 DSM Plan
- conduct an analysis of the projected rate and bill impacts for NSPI's ratepayers of ENSC's DSM programs, based on the cost projections contained in the 2013- 2015 DSM Plan

The Cost Allocation Report prepared by Elenchus, including attachments containing annual preliminary DSM program cost allocations and rate and billing impact analyses

for 2013-2015, is provided in Appendix C.

Elenchus has developed a cost allocation model (CAM) for ENSC that consists of two parts:

- Part One of the CAM uses the methodology that was filed with the UARB on Sept. 30, 2011, with additional information filed on Oct. 14, 2011. This part of the model is being used to prepare ENSC's audited financial statements for 2011. The same model will be used for allocating costs to ratepayers and taxpayers for ENSC's audited financial statements in future years.
- Part Two allocates the ratepayer-funded program costs to NSPI customer classes. Part Two of the model will be used for the rate rider adjustment commencing with the 2013 program year. It will establish the true-up adjustments for the NSPI rate riders to recover the total costs (including the allocated costs) based on ENSC's actual expenditures. This part of the model is consistent with the DSM Cost Allocation Approach that is in place for the years 2010, 2011 and 2012, as set out in the 2009 Settlement Agreement with one exception, as noted in Section 5.1.

5.1 DSM Cost Allocation Approach

The approach being taken by Elenchus in developing the CAM and in recommending changes to the DSM cost allocation approach was presented to stakeholders for comment and feedback at the two stakeholder sessions conducted by ENSC in November and December 2011.

A presentation by Elenchus at the November 3, 2011 stakeholder session outlined the approach and sought input on options for allocating costs. In addition, separate meetings

1 were held in person and by telephone to provide further briefings to stakeholders and
2 their expert advisors who were unable to attend the November 3 session. The purpose of
3 this stage of the consultation process was to survey the views of stakeholders prior to
4 finalizing the CAM.

5
6 At the December 8, 2011 stakeholder session, Elenchus presented the preferred options
7 for allocating ENSC's costs. The purpose of this session was to ensure that the
8 stakeholders had an opportunity to raise any concerns about the approach that was being
9 implemented in developing the CAM.

10
11 Two issues received the most attention during the stakeholder sessions:

- 12
13 • The weighting to be used in allocating costs on the basis of System
14 Benefits and Participating Class Benefits: There was broad acceptance for
15 the recommendation to maintain the 25/75 percent split that was agreed to
16 by stakeholders in the 2009 Settlement Agreement for use in 2010, 2011
17 and 2012.
- 18
19 • The allocator to be used for Enabling Strategies: There was general
20 support for the recommendation to replace the current allocator (customer
21 count) and instead allocate these costs using the System/Participant
22 Benefit approach where feasible, or using total other program costs as the
23 allocator where participating classes are not practical to identify.

24
25 ENSC is proposing the following modifications to the DSM Cost Allocation Approach,
26 based on the consultations with stakeholders and recommendations by Elenchus.

27
28 **Recommendation #1: Electricity DSM costs should continue to be allocated to NSPI**
29 **rate classes for purposes of determining the preliminary and final rate riders, with**
30 **25 percent of costs being allocated on the basis of system benefits, and 75 percent of**

costs being allocated on the basis of participating class benefits. This approach was accepted in the 2009 Settlement Agreement on the basis that it resulted in a reasonable division of costs and benefits between participating and non-participating classes. The premise of this approach is that no customer class should be made worse off as a result of the implementation of the DSM Plan.

Recommendation #2: Enabling Strategies costs should be allocated using the System/Participant Benefit approach similar to that used for other programs.

Hence, 75 percent of costs of the Enabling Strategy would be allocated on the basis of the customer classes that are expected to benefit from the Enabling Strategy, where those classes can be reasonably identified. Where it is not practical to identify the participating (or benefiting) customer classes), the Participant Benefit costs (75 percent of the costs of the Enabling Strategy) should be allocated on the basis of the proportional allocation of all other program costs to the customer classes.

This treatment of Enabling Strategies that targets specific customer classes maintains consistency with the treatment of other program costs. In the case of Enabling Strategies that target or benefit all customer classes, it is assumed that all customer classes will benefit in proportion to ENSC's total expenditures on other DSM programs. Because Enabling Strategies are intended to enhance the results of programs, program costs are a suitable proxy for the Participant Benefits of these Enabling Strategies.

It is recommended that this approach be implemented for allocating electricity DSM costs to customer classes for the 2013-2015 DSM Plan years.

5.2 Preliminary Program Cost Allocations, Rate and Billing Impacts

Tables showing the preliminary allocation of DSM program costs to electricity customer rate classes are provided in Appendix C, Attachment 1. The DSM costs for 2013-2015

1 include overhead costs based on a proportional mark-up to direct program costs. To
2 calculate the preliminary allocation of Enabling Strategies, all customer classes are
3 assumed to benefit in proportion to ENSC's total direct costs of the other DSM programs.
4 This is a change from previous DSM plans in which customer count was used to allocate
5 Enabling Strategies costs.

6
7 Preliminary DSM rate and electricity bill impacts are in Appendix C, Attachments 2 and
8 3. Since the 2012 DSM rate rider includes a true-up (balance adjustment) for 2010, the
9 DSM rate impact are showing both with and without the balance adjustment included in
10 the 2012 DSM rate.

11
12 The bill and rate impacts should be viewed as indicative only. Actual impacts will vary
13 for a number of reasons, including the following.

- 14
15 • When the CAM is used to allocate the ENSC's actual costs as per its
16 audited financial statements, the results can be expected to differ from the
17 preliminary budget which projects program costs using a standard mark-
18 up for overhead costs rather than the more detailed and precise CAM.
- 19
20 • Actual program costs may vary from the preliminary budget as ENSC
21 identifies opportunities. If expenditures are reallocated between programs
22 that benefit different customer classes, the rate and bill impacts by class
23 may change.
- 24
25 • NSPI rates and load forecasts can be expected to change in future years,
26 which will change the calculation of rate and bill impacts.
- 27

28 **5.3 Annual Rate Rider Adjustment Filing**

29

30 ENSC is requesting approval from the UARB that the responsibility for filing the annual

1 DCRR (DSM Cost Recovery Rider) adjustment by October 1st of each year be transferred
 2 from NSPI to ENSC. As is currently the case, the process will be used annually to adjust
 3 the rate rider with the balance adjustment of the previous year, along with the UARB-
 4 approved cost projection for the upcoming year. These projected costs for the upcoming
 5 year will be based on updated preliminary cost allocation tables as reported in the annual
 6 progress report filing and revised with the most recent NSPI sales forecasts by rate class.

6. ENSC'S RESPONSE TO VERIFICATION CONSULTANT'S REQUESTS

On January 9, 2012, the UARB directed ENSC to address, as part of its 2013 DSM filing, three issues arising from Dr. Peach's review of ENSC's Report on 2010 Evaluation and Verification Action Items (filed July 20, 2011) and ENSC's subsequent responses to Information Requests (filed November 18, 2011). The three issues and ENSC's responses are provided below.

6.1 The Safe Disposal of CFLs

Dr. Peach states:

One continuing need is development of provision for the safe disposal of CFLs (Request & Response IR-2). The marketing, promotion and installation of CFLs will eventually result in a large substitution of CFLs for less efficient incandescent lighting. As these new CFLs age they will eventually have to be replaced and as they approach the end of their effective useful life (EUL), a very substantial number will need to be disposed of each year. The eventual need for disposal of tens of thousands of CFLs per year is a non-trivial hazardous waste problem (essentially an externality associated with the production of energy savings by means of CFLs). ENSC suggests that establishing recycling centers for CFLs is outside the scope of the DSM program, though ENSC would be supportive of any initiative that helps to facilitate CFL recycling.

At the same time, ENSC is to be commended for solving the problem of disposal of large quantities of fluorescent tube lamps generated by the Administrator's DSM programs by arranging for them to be collected and shipped out of province for safe destruction in a specially designed "bulb eater" (and potentially developing access to a "bulb eater" in Nova Scotia in the future). While safe disposal of CFLs will require a different solution, at some point in the future large numbers of CFLs will need to be destroyed each year. Currently, as noted by ENSC, CFL recycling facilities do not exist in Nova Scotia. There are a few regions that have retail stores that provide in-store used CFL drop-off service, but many regions do not. Clean up for a single broken CFL follows a hazardous materials protocol. The possibility of thousands of tens of thousands of broken CFLs flowing into sanitation equipment and dumps is a prospect best avoided. This is a problem that will require continuing examination.

ENSC's Response:

As a point of clarification, the old fluorescent tubes from ENSC's Small Business Energy Solutions program are fully recycled, as opposed to being destructed in a standard bulb eater where its mercury-laden filter could end up in a landfill. The process that ENSC has been using for full recycling includes the packaging and transport of unbroken fluorescent tubes to a specialized facility in Quebec that completely separates the glass, metals, phosphors and mercury for re-use in new products. In 2011, the cost to ENSC for full recycling of fluorescent tubes was approximately \$300,000.

ENSC is aware that the Nova Scotia Department of Environment is engaged with other provinces, under the lead of Environment Canada, in developing an extended producer stewardship program, which will address the disposal of CFLs for the entire country. Extended stewardship programs would require producers to be responsible for the collection and disposal of CFLs, including the retrieval of mercury. The regulations are expected to be posted in the Canada Gazette this year, and it is anticipated that they would be approved and in force by January 1, 2014 to coincide with the Federal efficiency standard for general-service lights.

ENSC encourages and is supportive of this stewardship initiative.

6.2 Leveraging Sources of Financing

Dr. Peach states:

The response to IR-20 states that for the Small Business Energy Solutions program there is an option for on-bill financing. This concept of facilitating leverage through on-bill financing or, by extension, other sources of financing such as energy efficient mortgages has the potential to secure a multiple of the energy savings that would be possible through DSM Administrator funding alone. It lowers the DSM Administrator's cost per kWh conserved. It may be very important to gradually building the effectiveness of ENSC. It will be important for ENSC to gradually extend and develop this type of leveraging strategy.

ENSC's Response:

ENSC recognizes that lack of financial capital may be a barrier to customers adopting energy efficiency measures. Removal of this barrier could increase participation in energy efficiency programs and therefore increase energy savings. In co-operation with Nova Scotia Power, ENSC offers an on-bill financing option for businesses, non-profits and institutional customers.

ENSC has considered a broad range of potential financing options and is in discussions with several prospective partners about potential delivery of a financing program, which would make financing available to a much broader spectrum of potential DSM participants in all sectors. These include discussions with NSPI about an expanded on-bill financing program, discussions with chartered banks about the delivery of energy efficiency project financing, and discussions with other financial institutions about the potential use of New Houses program rebates as a source of funds for mortgage down payments. These potential financing options feature opportunities to leverage the financial capital, infrastructure and expertise of prospective partners, to assist participants in saving energy through user-friendly financing arrangements.

As discussions progress, more detailed cost-benefit analyses will be conducted to determine the cost per kWh based on the cost of capital acquisition and extent of interest rate buy down, administrative requirements and provisions for potential responsibility for loan losses. These analyses will guide the implementation of an expanded financing program in 2012, with the intention of gradually expanding the program as circumstances and opportunities allow.

6.3 A Dual Baseline Approach for Savings Evaluations

Dr. Peach states:

In Response to IR-25, ENSC notes that it is seeking advice on a dual baseline approach from its evaluation consultant which, if appropriate, could be implemented as part of the evaluation of the 2012 programs. This is a reasonable pace for development of a dual baseline approach. A dual baseline approach simply counts energy savings produced by retrofit of new equipment as the difference between the energy use of new equipment vs. existing equipment for the remaining useful life (RUL) of existing equipment and thereafter as the difference between the new equipment and the current standard replacement equipment on the market. However, as a dual baseline approach is developed it quickly becomes more complex in its details. It will be important for ENSC to develop and present its dual baseline approach, ideally during 2012 for use in the evaluation of 2012 programs.

ENSC has investigated the feasibility and benefits of implementing a dual baseline approach and is providing a two-part response. First, some background is provided, including an explanation of key terms and how a dual baseline approach differs from the more common method used to calculate savings. Second, ENSC addresses the costs, benefits and issues related to implementing a dual baseline approach, and indicates its commitments for 2012 with respect to considering the implementation of a dual baseline approach.

Background:

A dual baseline approach calculates energy savings using a more complex method than is used by the majority of North American DSM administrators. Most jurisdictions use the

1 effective useful life (EUL), or assumed average life of the new measure to calculate the
2 annual savings of the new measure. An example is the replacement of a heating system
3 with one that uses energy more efficiently. For the EUL of the new system (for example,
4 25 years), the difference in energy use between the new system and the replaced one is
5 claimed as energy savings.

6
7 A dual baseline approach uses, in addition to EUL, the remaining useful life (RUL) of the
8 replaced equipment, which is the length of time the equipment is expected to remain in
9 operation (the length of time until its EUL is at an end). Using a dual baseline approach
10 in the example of the heating system, the difference in energy use between the replaced
11 and new system is claimed as savings only for the RUL of the replaced system. After the
12 RUL (for example 10 years) of the replaced equipment and until the end of the EUL of
13 the new equipment (15 years, if the new system is assumed to have an EUL of 25 years),
14 the difference in energy use between the new system and the standard of equipment at
15 that time is claimed as energy savings. This method takes into account improvements in
16 technology and the market over time; even without an incentive, energy savings for some
17 equipment will occur when old equipment is replaced, because the standard version of
18 newer equipment uses less energy.

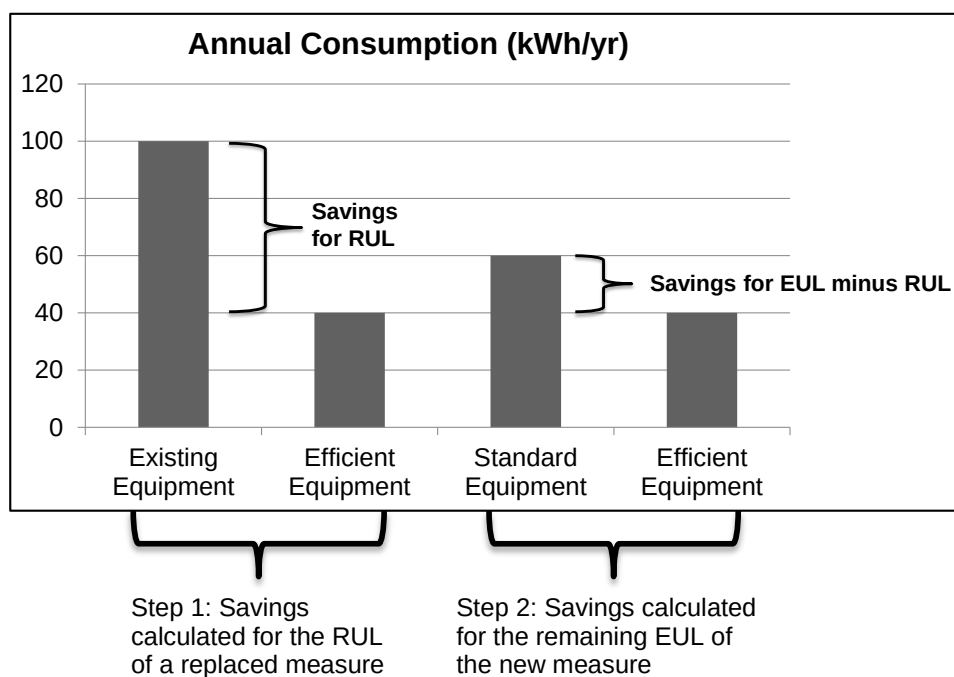
19
20 In the year an energy-efficient measure is installed, if the replaced measure is still in
21 working order, its RUL must be calculated based on its EUL and the length of time it has
22 been in use prior to replacement. Once calculated, energy savings are affected in the
23 following ways:

- 24
25 • When a measure is replaced and it has a RUL, the full unitary savings
26 value (the replaced measure's estimated annual kWh usage minus the new
27 measure's estimated annual kWh usage) is calculated. These savings can
28 be claimed for each year of the RUL of the measure (Figure 6.1, step 1).
29 When the RUL of the replaced measure expires in the future, a new
30 baseline for annual kWh savings must be used. This baseline is calculated

using the most common energy-use values for replacement products:
either those legislated through codes and standards or those installed by
common practice (Figure 6.1, step 2).

- If the replaced measure has reached the end of its EUL at the time of replacement, then the current code or most commonly used measure is used to calculate the energy savings, rather than the difference between the new measure and the replaced one.

Figure 6.1 - Two-part Calculation of Energy Savings Using a Dual Baseline Approach



A dual baseline approach would result in the following changes to ENSC's savings calculations:

- For a replaced measure at the end of its EUL, incremental savings would be calculated at a lower value than is currently calculated if common

1 practice or standards have an estimated annual kWh usage lower than the
2 replaced measure.

- 3
- 4 • For a replaced measure with an RUL, future cumulative energy savings
5 could change when the RUL expires. A new savings value would need to
6 be calculated if common practice or standards have an estimated annual
7 kWh usage lower than the replaced measure.

8

9 The approach would result in no changes to the following savings calculations:

- 10
- 11 • For replaced equipment having an RUL, annual incremental savings
12 claimed in the year the measure was installed would not change because
13 ENSC's current methodology is the same as it would be using dual
14 baseline.
 - 15
 - 16 • For replaced measures for which the energy use of a standard or common
17 replacement is the same as the replaced measure, annual and cumulative
18 savings would not change.
 - 19
 - 20 • When measures are added to a residential or commercial site rather than
21 replaced, annual and cumulative savings would not change because no
22 replacement of a measure occurs.
 - 23
 - 24 • For new construction, expansion or renovation projects, savings would not
25 change because the measures implemented would be considered market-
26 driven decisions, not discretionary replacement decisions. Therefore, they
27 do not need to be accounted for using a dual baseline.
 - 28

Implementation of a Dual Baseline Approach:

ENSC agrees with Dr. Peach, as stated in the 2010 Verification Study, that adopting a dual baseline approach for ENSC programs would more accurately record energy savings in some situations. The majority of ENSC programs target replacement of equipment having a RUL, so the approach for calculating annual incremental savings would not change. However, the cumulative savings claimed by ENSC would be reduced, since full replacement savings are currently claimed, rather than a change in savings occurring upon expiry of the RUL of the replaced equipment.

Because of its complexity, a dual baseline evaluation involves additional research and resources. After receiving input and advice from its consultants, ENSC has the following concerns regarding implementation:

- Resources required for implementation: The establishment of the current baseline and the remaining useful life of measures is complex and requires accurate market data in order to make reliable assumptions. Much of this information has not yet been collected in Nova Scotia. In the absence of specific product legislation, the difficulty of establishing current market baselines is even greater. As an example, ENSC will need to determine how the distribution of actual measure lifetimes around the average EUL will factor into savings calculations. ENSC will need to devote significant resources for the determination of the dual baseline for each measure used.
- Cost-effectiveness given the size of Nova Scotia's market: The few regions in North America that have implemented dual baseline have done so for large customer programs that can devote significant resources to determining the baseline. The majority of ENSC's programs focus on small and medium enterprises and residential customers.
- Recalculation of the IRP: The long-term DSM savings targets used for the

1 IRP would require adjustment. Cumulative savings are currently
2 determined by adding each year's incremental savings to the sum of all
3 previous years' incremental savings. With the implementation of dual
4 baseline, ENSC's forecasted IRP cumulative savings would need to be
5 revised to incorporate the change in savings that would occur whenever a
6 replaced measure reaches the end of its EUL. Tracking these results as
7 well as changes in common practices and standards would require a
8 greater investment of time and resources.

- 9
10 • Application of dual baselines across the organization: If a dual baseline
11 approach is developed, it would not be feasible to implement it for every
12 program. For example, in programs that offer a large number of products
13 that change frequently, in which participants are not likely to know how
14 long existing measures have been installed, or that do not involve
15 communication with end users, it would not be practical to incorporate a
16 dual baseline evaluation. Considering the few programs for which dual
17 baseline may be practical, the benefits of greater accuracy of evaluated
18 savings may be exceeded by the associated costs.

19
20 ENSC understands the added value of implementing a dual baseline approach. However,
21 ENSC believes that a measured approach to deciding whether to implement a dual
22 baseline policy is prudent. Even if only a small portion of programs implement a dual
23 baseline, the time and resources required to do so may be significant. This investment
24 must be weighed against the value gained.

25
26 As a result of the noted concerns, it is prudent for ENSC to complete a more thorough
27 analysis to determine if the implementation of a dual baseline approach is feasible. ENSC
28 commits to the following tasks in 2012:

- 1 • determine the programs in which early replacement is a major component
- 2 and prioritize them on the basis of the potential success of determining a
- 3 baseline
- 4 • assess other jurisdictions' determination of dual baseline mechanisms and
- 5 identify the lessons learned from their experiences
- 6 • evaluate the benefits and costs of implementing a dual baseline approach
- 7 in the programs identified as priorities, including an assessment of the
- 8 likely change in annual incremental and cumulative savings over time
- 9 • review the feasibility, conditions and impacts of implementing a dual
- 10 baseline policy in Nova Scotia

7. CONCLUSION

The 2013-2015 DSM Plan provides a sound approach for enabling Nova Scotians to achieve significant and cost-effective energy savings while building capacity for continued long-term success. The 2013-2015 DSM Plan incorporates the Nova Scotia DSM experience gained to date and strives for ambitious energy efficiency and conservation goals while remaining financially responsible.

With this Application, ENSC is seeking:

- approval of the 2013-2015 DSM Plan, provided as Appendix A, and its associated multi-year framework as outlined in Section 3
- approval to transfer the responsibility for filing the annual DCRR adjustment, from NSPI to ENSC
- approval of revisions to the DSM Cost Allocation Methodology commencing with the 2013 DSM plan year

Appendix A

2013-2015 DSM Plan

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1.0 INTRODUCTION

ENSC drew from its experiences delivering the 2011 DSM programs, consulted with stakeholders and engaged Navigant and Dunskey Energy Consulting (Dunskey) to develop the 2013-2015 DSM Plan. The proposed plan is a comprehensive portfolio of DSM programs for residential customers, businesses, non-profit organizations and institutions, which will cost-effectively deliver electrical energy and demand savings. While the 2013-2015 DSM Plan includes information on approach and efficiency measures, as with all plans, it must incorporate a degree of flexibility. As ENSC implements the Plan, elements may be revised to reflect lessons learned, changing circumstances, new information or evolving market conditions.

Whether it was partnering with Air Miles on online promotions or meeting with Nova Scotians at community trade shows, 2011 illustrated that Nova Scotians are receptive to energy efficiency and they expect a positive customer experience. That is why ENSC is moving towards a true “one-window” approach to customer service. It is an experience that puts the customers first and does not expect them to know which ENSC programs work for them. Instead, a customer-focused approach allows Nova Scotians to simply connect with ENSC and let the Corporation’s staff provide a personalized energy solution for each customer.

With that in mind, ENSC’s marketing efforts for 2013-2015 will aim at reinforcing the concept that Efficiency Nova Scotia is the place to turn for customer solutions. This broader marketing approach may employ seasonal campaigns using traditional and social media, as well as earned media to drive the general public to Efficiency Nova Scotia for their energy efficiency questions and needs.

The expectation is that by 2015, marketing will focus primarily on general promotions aimed at raising the profile of Efficiency Nova Scotia as the organization with energy efficiency solutions for residential customers, businesses, non-profit organizations and institutions. Selective, program-specific campaigns will continue as warranted, and will

1 target highly segmented customer bases, through a combination of e-marketing,
2 advertising (i.e. in trade journals), social media and grassroots, and social marketing
3 campaigns. While the benefits of DSM to reduce fuel bills and improve bottom lines are
4 generally evident to program participants – particularly those who are making significant
5 changes – the broader benefits of DSM, as they relate to the environment and the
6 economy, are not as readily understood by the general public. Efficiency Nova Scotia is
7 committed to communicating these benefits, through education, community outreach and
8 awareness-building.

9
10 ENSC recognizes that, in the long term, an important aspect of the energy efficiency and
11 conservation business is changing the energy culture in Nova Scotia. Public information,
12 education and awareness are required to build increasing support for this change. For
13 ENSC, it includes identifying and understanding the barriers and benefits, and developing
14 strategies for the gradual shift to a new norm for Nova Scotia where every sector in the
15 province is more efficient with respect to energy use. Not unlike the journey of change in
16 Nova Scotia in recent years regarding solid waste management, we need comparable
17 progress, community by community, on reducing our energy waste in all sectors in order
18 to improve our productivity and competitiveness. It is essential however, to engage
19 directly with individual Nova Scotians in ways that help them to understand the relevance
20 of energy efficiency and conservation to their interests, and that contribute to their
21 adoption of energy efficiency and conservation as an individual and social norm. The
22 implementation of the home energy report initiative, approved in the 2012 Plan,
23 contributes to this objective. In addition, ENSC will work to build community-based
24 social marketing into its services so that all programs, including those based largely on
25 incentives, contribute not only to immediate reductions in energy use but also to
26 behaviours that sustain those energy savings and that lead to increased energy savings in
27 the longer term.

28
29 The 2013-2015 DSM Plan documents the objectives and approaches for the delivery of
30 ENSC's energy efficiency programs and services. Section 2 describes programs and
31 services for residential customers. Programs and services for businesses, non-profit and

1 institutional customers are discussed in Section 3. Enabling strategies including activities
2 focused on education, development and research, and on developing industry standard
3 practices are described in Section 4.

1.1 2013-2015 DSM Plan Savings and Investment

ENSC will invest \$144.4 million (in 2013 dollars) over three years, from 2013 to 2015, to achieve 410.8 GWh and 79.8 MW of incremental installed annual net savings at the generator. The annual savings targets and investments are in Figure 1.1

Figure 1.1 - 2013-2015 DSM Plan Savings and Investment

Year	Investment (\$ million)	Lifetime Benefits (\$ million) ^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC) ^b	Program Administrator Cost Test (PAC) ^c
2013	46.2	103.6	135.2	25.9	1.6	2.2
2014	47.7	116.0	137.8	27.0	1.7	2.4
2015	50.4	124.8	137.8	27.0	1.7	2.5
Total	144.4	344.3	410.8	79.8	-	-

Currency is expressed in 2013 dollars. Columns may not add correctly due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

Figures 1.2, 1.3 and 1.4 present program investment budgets, and the incremental annual GWh energy and the MW demand net savings at generator for 2013, 2014 and 2015, respectively. They also provide the lifetime total resource benefits, the total resource cost (TRC) test results and the program administrator cost (PAC) test results for each of the three years.

1

Figure 1.2 - 2013 DSM Plan Savings and Investment

2013	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	4.0	8.4	18.1	2.8	1.6	2.1
Existing Residential ^d	8.7	14.8	14.3	3.5	1.1	1.7
New Residential	5.5	8.3	5.8	1.5	1.2	1.5
Energy Savings Actions ^d	1.0	1.0	15.0	3.5	1.0	1.0
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	8.1	25.0	30.3	5.2	2.0	3.1
Custom Incentives	9.5	36.4	40.3	7.4	2.1	3.8
Direct Installation	4.6	9.7	11.4	2.0	1.7	2.1
ENABLING STRATEGIES						
Education and Outreach	2.5	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	1.0	-	-	-	-	-
Total	46.2	103.6	135.2	25.9	1.6	2.2

Currency is expressed in 2013 dollars. Columns may not add correctly due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

1

Figure 1.3 - 2014 DSM Plan Savings and Investment

2014	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	4.2	10.0	19.3	3.1	1.9	2.4
Existing Residential ^d	10.4	20.0	16.9	4.2	1.2	1.9
New Residential	6.6	10.4	6.8	1.8	1.3	1.6
Energy Savings Actions ^d	1.0	1.0	15.0	3.5	1.0	1.0
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	8.0	28.4	31.2	5.5	2.4	3.6
Custom Incentives	9.1	38.4	40.3	7.4	2.3	4.2
Direct Installation	3.5	7.8	8.4	1.5	1.8	2.2
ENABLING STRATEGIES						
Education and Outreach	2.7	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	1.0	-	-	-	-	-
Total	47.7	116.0	137.8	27.0	1.7	2.4

Currency is expressed in 2013 dollars. Columns may not add correctly due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

1

Figure 1.4 - 2015 DSM Plan Savings and Investment

2015	Investment (\$ million)	Lifetime Benefits (\$ million)^a	Incremental Annual Net Energy Savings at Generator (GWh)	Incremental Annual Net Demand Savings at Generator (MW)	Total Resource Cost Test (TRC)^b	Program Administrator Cost Test (PAC)^c
RESIDENTIAL DSM PROGRAMS						
Efficient Product Rebates ^d	5.0	13.0	22.2	3.6	1.8	2.6
Existing Residential ^d	11.5	24.5	18.9	4.8	1.2	2.1
New Residential	7.9	13.1	8.1	2.1	1.4	1.7
Energy Savings Actions ^d	1.0	1.6	15.0	3.5	1.6	1.6
BUSINESS, NON-PROFIT AND INSTITUTIONAL DSM PROGRAMS						
Efficient Product Rebates	7.6	26.8	28.3	4.9	2.4	3.5
Custom Incentives	9.2	39.0	38.8	7.0	2.3	4.2
Direct Installation	2.9	6.8	6.6	1.1	1.9	2.3
ENABLING STRATEGIES						
Education and Outreach	2.9	-	-	-	-	-
Development and Research	1.4	-	-	-	-	-
Other Enabling Strategies	0.9	-	-	-	-	-
Total	50.4	124.8	137.8	27.0	1.7	2.5

Currency is expressed in 2013 dollars. Columns may not add correctly due to rounding.

An avoided cost of \$135/MWh was provided by NSPI in February 2012 and includes the combined cost of energy and capacity.

^a Lifetime benefits are expressed as the net present value of the avoided costs, including energy and capacity, over the life of the program measures.

^b TRC is a benefit/cost ratio comparing lifetime benefits to the sum of ENSC's and participants' costs.

^c PAC is a benefit/cost ratio comparing lifetime benefits to ENSC's costs.

^d Includes participation by low income households.

2.0 RESIDENTIAL PROGRAMS AND SERVICES

The overarching objective for ENSC's residential sector electricity DSM initiatives is to help Nova Scotians achieve long-term energy savings by building energy efficiency and conservation considerations into their decision making. Specific measures focus on increasing the adoption of energy-efficient lighting, appliances, consumer electronics and other mass-market products, as well as more comprehensive approaches to electrical energy savings by addressing whole-home efficiency, space- and water-heating equipment. Additionally, the residential initiatives encourage customers to turn in or replace inefficient or spare appliances that are still in use, and make other changes that will reduce consumption. They will also provide broad-based education based on social- and behavioural-change research and increase awareness of individual home energy use compared to peers via direct mail home energy reports, enabling Nova Scotians to save energy through their energy-efficient behaviour.

Residential initiatives are summarized using the following four categories, although delivery with ENSC's customer-focused approach will emphasize customers' specific needs and services:

- Efficient Product Rebates (includes components currently referred to as Retail Markdown and Appliance Retirement)
- Existing Residential (provides services for all existing residential housing)
- New Residential (includes the program currently referred to as EnerGuide for New Houses)
- Energy Saving Actions (includes the new program currently referred to as Home Energy Report)

2.1 Efficient Product Rebates

Financial incentives to offset the higher cost of efficient products, along with public awareness, education, and retail availability, are the foundation of Efficient Product

Rebates. All homeowners and renters can take part. Low income residential homeowners and renters may receive free efficient products through direct installation within the Existing Residential service offerings, as identified in section 2.2.

Financial incentives are provided to customers who purchase eligible high efficiency products. ENERGY STAR® products are promoted, and financial incentives are offered for selected products that meet or exceed the ENERGY STAR® level of performance. Eligible measures include a variety of lighting products, appliances and electronics.

The Appliance Retirement component offers cash incentives, and free pick-up and recycling of second, inefficient but functioning, refrigerators and freezers.

2.2 Existing Residential

The Existing Residential service is designed to promote cost-effective energy efficiency improvements to Nova Scotia's housing stock of single detached houses, duplexes, rental housing, mobile/mini homes and multi-family buildings, and includes small community buildings such as firehalls and churches.

Incentives are available for lighting upgrades, measures to reduce electric water heating energy use, appliance upgrades and other items. Incentives for homes with electric space-heating may include a full range of envelope measures, such as air-sealing and insulation, and green heating system measures.

The Existing Houses program will likely continue to be offered within a seamless, all-fuels home retrofit program, with funding from the Province of Nova Scotia covering the rebates for non-electric energy efficiency improvements. Through a competitive Request for Proposal process, ENSC contracts with service organizations and their certified energy advisors who operate throughout the province. Implementation policies and procedures are in place with service organizations and may be modified as appropriate to enhance the program.

Enhancements over previous programming include:

- renter eligibility
- direct installation of certain low-cost measures during the initial audit
- innovative financing methods
- customer advisory assistance (through an enhanced delivery agent service, to identify all eligible measures and guide participants through the process)
- trade ally engagement (including developing and maintaining a list of qualified contractors, and supporting and promoting contractor training in building science and key measures, such as air sealing)

Low Income

The Low Income Homeowners component builds on the existing program, providing free energy audits and turnkey implementation of energy efficiency measures at no cost to participants. Building envelope measures include upgrades such as draft-proofing and insulating the basement, crawl spaces, walls and attic. Additional measures may include installing CFLs, insulating the electric water tank and hot water piping, installing low-flow shower heads and faucet aerators, providing power bars to reduce standby losses from electronic devices, installing programmable thermostats, and replacing qualifying freezers and refrigerators with ENERGY STAR® Tier 3 appliances. The Low Income Homeowners component also includes customer education and the free installation of program measures on a site-by-site basis. Eligible measures may be expanded to include advanced drain water heat recovery and fuel substitution, which will provide low income households with higher levels of energy and cost savings.

A direct installation service will be provided to low income renters in single-family and multi-family dwellings. Products such as CFLs, power bars with integrated timers, and hot water tank and pipe insulation will be installed, and incandescent holiday lighting will be exchanged for LED lights. Large appliances will be assessed for potential replacement, and information on efficiency will be provided to the renter.

1 Low-income seniors are a specific market segment that ENSC can target for participation
2 in its programs.

3
4 ENSC's 2013-2015 DSM Plan includes an investment of \$13.3 million in Low Income
5 DSM programs over three years to achieve 19.0 GWh of incremental annual energy
6 savings.

7 8 **Green Heating Systems**

9 The promotion of green heating systems is intended to increase market penetration of
10 space and water heating systems that provide all, or a substantial share, of their heat from
11 renewable energy sources, i.e. from solar energy provided directly by the sun, from heat
12 stored in the air or ground, or from biomass. Information on green heating systems is in
13 Appendix E.

14
15 This service will target the residential sector, including existing homes and new
16 construction, within a seamless, all-fuels offering, and will provide incentives for the
17 following technologies:

- 18
19 • Solar thermal (space and water heating)
- 20 • Ground source heat pumps
- 21 • Biomass systems (stoves, boilers or furnaces, including whole-house
22 automated systems)
- 23 • Ductless air source heat pumps
- 24 • Ducted air source heat pumps

25
26 Eligible systems may be revised as appropriate, based on market conditions, technology
27 development, evaluation and verification results, and implementation experience.
28 Focused on the promotion of the most efficient systems available, specifications for each
29 eligible technology will, to the extent possible, be based on independent third-party
30 processes, which may include minimum efficiency or other quality requirements.

Marketing activities will promote the benefits of specific systems, as well as the broader benefits of green heating systems, efficiency and the reduction of environmental impacts.

As a component of its capacity building strategy to develop relationships with its trade allies, ENSC will develop and maintain a list of qualified contractors, plumbers and HVAC installers who meet defined criteria. ENSC will promote and support training for contractors and installers. ENSC will evaluate the opportunity to provide upstream incentives to contractors, installers, and builders.

ENSC recognizes that there are specific issues for some technologies, translating into higher barriers to adoption of those technologies. Of particular interest are automated whole-house pellet boilers and furnaces. ENSC may work with potential distributors to understand and help overcome barriers to establishing or piloting a wood pellet delivery service. This could include support and promotion of demonstration projects to increase awareness of this opportunity.

2.3 New Residential

The New Residential services are available to builders and owner/builders of new houses in Nova Scotia, to encourage the construction of high performance housing by promoting the use of energy-efficient products and design practices. Objectives include:

- increasing the number of new houses that exceed the Building Code energy efficiency requirement
- increasing the number of new houses installing ENERGY STAR[®] labeled products

Strategies used to achieve the objectives include design consultation, financial incentives, promotion and marketing, and contractor education and training.

1 Energy assessments and design advice are provided to builders before construction.
2 Using data on the planned building envelope and equipment, along with the expected
3 energy consumption, energy analysts suggest improvements that will enhance the
4 expected energy performance. The EnerGuide system rates homes on a scale of 0-100
5 based on the expected energy performance of the home, which is determined through
6 computer software modeling. Upon completion of the new home, a final inspection and
7 rating is provided. The Nova Scotia Building Code requires all new residential houses to
8 either meet prescriptive requirements (intended to achieve an EnerGuide rating of 80) or
9 demonstrate an energy efficiency performance through an EnerGuide rating of 80. To
10 promote higher efficiency in new construction, ENSC's current minimum incentive
11 eligibility threshold is an EnerGuide rating of 83 and will be revised as code revisions are
12 implemented. ENSC will adapt its program design and eligibility criteria, based on the
13 evolution of the federal rating system and tools available. A tiered incentive structure will
14 be offered, providing higher incentives for houses that achieve higher EnerGuide ratings.

15
16 Marketing activities will target builders, buyers of new homes and trade allies who
17 support the new home industry. Trade ally outreach will include training in residential
18 new construction focusing on best energy efficiency practices, advanced design
19 techniques and the integration of energy efficiency technologies into a home's design.

20
21 ENSC will continue to work with municipalities to increase participation by providing
22 program information at the permit application stage. ENSC will work with the Canada
23 Mortgage and Housing Corporation to allow participants to use ENSC rebates as part of
24 their mortgage down payment.

2.4 Energy Saving Actions

The Energy Saving Actions initiative being implemented in 2012 is known as the Home Energy Report and involves a combination of mailed information and an Internet portal. It may be continued for use in 2013 to 2015 and/or enhanced and expanded. In addition to expanding the number of customers receiving reports, future versions may make use of smart meters, other platforms and channels, and modified messaging.

The Home Energy Report is designed to produce measurable, cost-effective energy savings for residential customers by providing feedback on their household energy consumption. This is not a measure-specific service, but rather targets behavioural changes (e.g. lowering the thermostat, using cold water for clothes washing, switching off lights in unoccupied rooms, etc.). The program is also expected to drive participation in other ENSC residential services.

The program, to be delivered in cooperation with Nova Scotia Power, is designed to provide residential customers with regular feedback on their electricity use via their electricity bill or through direct mail. The feedback will show the customer's consumption over time and compare it with relevant benchmarks, such as averages for similar homes, or those in the neighbourhood. The comparison homes with their relative efficiency rankings will be anonymous. The program may also provide participants with:

- a qualitative performance assessment focusing on positive reinforcement as energy efficiency behaviours are implemented, and energy consumption decreases
- recommendations for improving energy efficiency through behavioural changes, low-cost and larger-scale measures
- referrals to, and promotion of, relevant ENSC DSM programs

Customers will have the option of completing an online or mail-in questionnaire about their home, which will allow ENSC to provide more customized recommendations.

3.0 PROGRAMS AND SERVICES FOR BUSINESSES, NON-PROFIT AND INSTITUTIONAL CUSTOMERS

ENSC is using the term “Business, Non-profit and Institutional” (BNI), to describe the sector formerly referred to as “Commercial and Industrial (C&I)”. This does not change the target markets and more accurately describes segments, such as healthcare and education, which typically do not self-identify as commercial or industrial.

The objective of ENSC’s electricity DSM initiatives in this sector is to build energy efficiency and conservation considerations into its’ customers’ decision-making processes. ENSC’s energy efficiency services for this sector include program categories that package technical and financial resources and deliver a suite of products and services to targeted segments.

ENSC’s aim is to provide a single point of contact through which BNI customers may access its services. With this approach, energy efficiency services are offered through direct outreach to targeted segments and through the strategic technical support of qualified trade allies. The goal of this strategy is to enable ENSC staff and qualified trade allies to work one-on-one with customers to develop plans tailored to their needs.

Initiatives for the Business, Non-Profit and Institutional sector are described using the following three categories, although delivery with ENSC’s customer-focused approach will emphasize customers’ specific needs and services:

- Efficient Product Rebates (includes components currently referred to as Business Energy Rebates and Smart Lighting Choices)
- Custom Incentives
- Direct Installation (includes the Small Business Energy Solutions program)

3.1 Efficient Product Rebates

The Efficient Product Rebates category is intended to secure cost-effective electrical energy savings for customers in the retrofit and new construction markets, through promotion and rebates on high-efficiency equipment. To address first-cost barriers, ENSC offers financial incentives, including measure rebates, which typically buy down the participant's incremental cost of efficiency to a simple payback of one to five years. The incremental cost of a measure is the difference in first cost to the customer between the standard efficiency product and the high-efficiency product. In addition to offering measure rebates, ENSC offers financing to qualifying customers for the remaining portion of project costs. The goal of offering financing for the non-incentive portion of a project is to enable customers to install energy-efficient technologies without requiring them to commit the full capital cost at project initiation. By offering measure rebates and project financing, ENSC will provide a full-service solution for customers to implement energy-efficient technologies.

In 2012, Business Energy Rebates (BER) and Smart Lighting Choices (SLC) will be combined as the Business Energy Rebates (BER) program.

The BER program is designed to use existing market channels to promote high-efficiency equipment and to encourage the adoption of efficient technologies. BER provides prescriptive rebates to qualifying customers for a variety of efficient product types. The BER program is focused on market-driven opportunities in natural replacement and new construction markets. It offers rebates and upstream discounts for qualifying equipment or services in new construction or retrofit projects. Businesses and owners/operators of multi-unit residential buildings are eligible to participate in the program.

The Business Energy Rebates program targets equipment for which the unit electrical energy savings can be reliably prescribed, and standard per-measure savings and incentive levels can be, or have already been, established.

Program measures include products and services in the following areas: lighting; heating, ventilation and air conditioning (HVAC); adjustable speed drives for motors; refrigeration; compressed air; food service and hospitality equipment; and agricultural and food processing equipment. Program measures and measure categories are subject to change.

For targeted market segments, technical and financial services will be bundled into a single application package for delivery. For instance, lighting measures are commonly included in packages for a variety of industries and building types, while commercial ice machines are less common and primarily included in market segments such as hospitality and food service.

While most customers will receive these services through their ENSC key account manager, qualified trade allies may also help customers engage in programs.

3.2 Custom Incentives

The Custom program is designed to secure cost-effective electrical energy savings from energy efficiency projects and to promote efficient fuel choices in new construction projects as well as existing facilities.

The program works directly with eligible customers to identify and implement cost-effective electrical energy and demand saving measures on a case-by-case basis. Participants may choose to aggregate multiple sites into a single retrofit project for which cost-effectiveness is improved and incentives from other programs do not apply.

The Custom program offers financial assistance for engineering studies and upgrades, with the goal of helping customers complete all phases of their electrical energy efficiency projects. The Custom program promotes the engineering and installation of electrical energy-efficient products or measures for which the operation and characteristics are not conducive to a prescriptive rebate structure. The installation of

these measures is conducted by third parties or qualified participant staff, as selected by the participant. The recruitment of participants with custom projects depends largely upon direct contact, referrals, and networking among program allies to identify feasible projects. Because of their complexity, custom projects can have longer lead times.

While all BNI customers will remain eligible to participate in the Custom program, ENSC will continue to refine its services for market segments. This aligns with its customer-focused approach, offering both custom and prescriptive services and incentives that consider the needs of the market segments. ENSC may target segments such as grocery stores, commercial refrigeration, schools, large multi-unit residential buildings, military, and high-tech industry.

New construction and major renovation projects are eligible for the Custom program through one of the energy modeling or the whole building paths.

New construction technical services will provide participants with financial support for consulting services that deliver efficient facility designs. Additional implementation incentives through the Custom program, rebates through the Business Energy Rebates program and project financing will be available to participants who opt for qualifying efficient designs. New construction incentives will be based on the incremental electrical energy savings and the difference in measure costs between the proposed design features and a baseline design (for example, one conforming to Canada's Model National Energy Code for Buildings). ENSC will pre-approve all incentives for new construction technical services.

Eligible measures must save electrical energy and may vary based on custom applications. Measures may include system upgrades, green heating systems, and equipment not addressed through other ENSC programs.

Measures are categorized as:

- market-driven measures, such as equipment replacement, new construction, renovation and expansion, where the program can result in higher efficiency choices than would otherwise have been purchased
- discretionary retrofit measures, where energy-efficient lighting, HVAC equipment, refrigeration, motors, process equipment or building envelope components are replaced before the end of their useful lives as a cost-effective retrofit

Technical and financial services may:

- help participants identify and secure qualified third-party sources of technical expertise
- provide incentives and rebates for initial scoping studies or audits of existing facilities, and for detailed engineering assessments of specific retrofit projects
- provide funding support for technical assistance to achieve more efficient designs in new facilities and major renovation projects
- provide financial incentives for implementing cost-effective electrical energy efficiency projects
- provide project financing through low- or no-interest repayable loans, or where available, other financing options to support the program

The Custom program will continue to provide customized offerings for market segments and targeted end uses, such as retro-commissioning, compressed air and energy management information systems, and will develop new market segments, recruit additional trade allies, and continue to build technical expertise through program staff training. Potential initiatives include continuous energy improvement at sites, and biomass energy feasibility studies. Although a targeted market sector and end-use

1 approach requires a range of talents and technical expertise, this strategy can achieve
2 significant savings at a low cost.

3
4 Custom implementation incentives are based on incremental cost investment barriers for
5 market-driven and new construction measures, and the full-cost investment barrier for
6 retrofit projects. While the program provides general guidance for setting incentives, the
7 actual incentive for each project is based on a case-by-case analysis of energy savings
8 and rate of return.

9 10 **3.3 Direct Installation**

11
12 In the Direct Installation category, the Small Business Energy Solutions (SBES)
13 program is designed to acquire electrical energy savings through the direct installation
14 of energy-efficient measures for small businesses, primarily through high-performance
15 lighting retrofits. Formerly referred to as “Small Business Direct Install”, the new
16 program name reflects an expanding suite of eligible measures.

17
18 A broad range of businesses, non-profit organizations and institutional customers can
19 benefit from this program, including small offices, retail shops, convenience and grocery
20 stores, service stations, restaurants and lodgings, non-profit organizations, government
21 facilities, cafeterias, pharmacies, bakeries, farms, and institutional and healthcare
22 facilities. Non-profit and voluntary organizations have an important role in our
23 communities and their financial resources are stretched very thinly; ENSC can help by
24 making their facilities more efficient.

25
26 The program provides direct, turnkey installation of a set of cost-effective, energy-
27 efficient measures. Energy-saving opportunities are either addressed by the current suite
28 of measures, or noted for future programming. Implementation contractors identify and
29 recruit service providers for the direct installation of measures and the recycling/disposal
30 of old materials.

1 Projects typically include upgraded lighting, refrigeration equipment, hot water
2 conservation, compressed-air leak reduction, and controls. The program design may be
3 modified as required to achieve electrical energy savings through the direct installation of
4 other cost-effective, electrical energy-efficient measures, as opportunities arise.

5
6 The implementation contractor conducts the program marketing and generates leads. The
7 contractor conducts the efficiency audit, at no charge to the customer, using an audit tool
8 provided by ENSC. ENSC reviews all audits and grants approval to proceed. The
9 contractor orders and installs the materials and removes the old materials for
10 recycling/disposal.

11
12 ENSC may authorize the contractor to work with third parties, such as business
13 associations or Chambers of Commerce, to promote the program. ENSC either approves
14 or develops all program marketing materials, and may provide additional targeted
15 marketing support.

16
17 Incentives may cover up to 80 per cent of the overall project cost, and may be paid
18 directly to the contractor to minimize out-of-pocket expenses for participants. ENSC may
19 also offer financing to cover the balance of customer costs.

4.0 ENABLING STRATEGIES

Enabling Strategies include the following elements:

- Education and Outreach
- Development and Research
- Innovative Financing
- Capacity Building
- Working with Governments

Enabling Strategies have two purposes:

- to support the achievement of energy savings through participation in ENSC's DSM services (Education and Outreach, Development and Research, Innovative Financing, and Capacity Building)
- to drive market transformation by changing standard industry practices, notably through training, labeling and regulation (Capacity Building and Working with Governments)

4.1 Education and Outreach

Education and Outreach has been part of the electricity DSM plans in Nova Scotia since 2008, and will continue in 2013 through 2015. This component of ENSC's strategy is designed to increase awareness by all Nova Scotians of the value of energy efficiency, leading to greater levels of participation in DSM programs.

Nova Scotians will adopt energy-efficient behaviours if they understand the value of energy efficiency to their own interests and to those of their communities, particularly if their understanding is reinforced by the emergence of energy efficiency as an individual and social norm. To further encourage Nova Scotians to participate in DSM programs, ENSC will continue to focus on systematic education and outreach efforts that enhance

customer understanding, complemented by a wide variety of communications activities. Education and outreach strategies for 2013 through 2015 will build on existing programs, research, feedback from Nova Scotians (through customer feedback, presentations, speeches, trade shows, online dialogue, and so on), and experience gained through past DSM initiatives.

Areas of focus include:

- educating customers on the value provided by electricity DSM
- educating students on energy efficiency and its economic and environmental benefits
- educating customers on ways to conserve energy, reduce peak demand, achieve cost-effective energy savings and lower their electric utility bills;
- increasing public awareness of the value of participating in DSM programs
- enabling and encouraging the adoption of energy efficiency as a social norm through a focus on both individual and community-based commitments to energy efficiency
- connecting customers to relevant DSM programs and services
- learning from our customers – ensuring their experiences and advice are incorporated to improve programs and services

The following components support this strategy:

- training for delivery agents to directly answer customers' inquiries and provide energy efficiency information related to the relevant efficiency services for the customer
- a revised website (www.efficiencyns.ca) with a strong customer focus, providing energy technical information, program materials, assistance and links to other resources, as well as complementary social media

(Facebook, Twitter, YouTube) to drive awareness and use of ENSC's online presence

- marketing and advertising materials that highlight Nova Scotians' energy efficiency successes and encourage others to participate
- the use of community-based social marketing to increase the opportunities for individuals, businesses and organizations to include energy efficiency in their decision making and influence others to adopt energy-efficient behaviours
- online energy analysis software and other energy savings calculators to help make energy efficiency and conservation more tangible
- the Green Schools program, to supplement learning and stimulate young people about energy efficiency and help build an energy-efficient culture in Nova Scotia
- public speaking and presentations on energy efficiency
- stories in the media on energy efficiency
- additional activities as opportunities arise

ENSC staff will work with contractors and educational institutions, including schools, community colleges and universities, to develop, manage and deliver education and outreach programs.

Energy savings are not attributed directly to Education and Outreach activities. Rather, energy savings are captured through participation in the individual DSM programs that benefit from broad-based education and outreach activities.

4.2 Development and Research

Through its Planning and Analytics division, ENSC will focus on emerging electrical energy efficiency strategies and technologies. This includes staying abreast of strategy and technology development, as well as evaluation methodologies, analysis and reporting of results and energy efficiency activities in other jurisdictions. ENSC will continue to

1 develop expertise in new, energy-efficient technologies and program strategies that have
2 the potential to generate additional energy-savings opportunities.

3
4 Through activities such as market assessments, baseline evaluations and pilot projects,
5 ENSC will continue to explore opportunities for DSM programming. Although no
6 electrical energy or demand savings are attributed directly to this effort, the knowledge
7 and experience gained through development and research activities are intended to
8 increase the effectiveness of all DSM programs and develop new DSM opportunities for
9 future years. To do so, ENSC will work to identify and understand barriers to the
10 adoption of energy-efficient behaviours and to develop strategies that will enable a shift
11 to a social norm that embraces energy efficiency. For example, ENSC may work with
12 potential distributors of wood pellets to understand and help overcome barriers to
13 establishing or piloting a wood pellet delivery service. This could include support and
14 promotion of demonstration projects to increase awareness as well as peer- and
15 community-based promotion of the service.

16
17 The DSM tracking system, public opinion surveys and market research will continue to
18 be important tools that help ENSC to understand Nova Scotians' behaviours and
19 determine effective ways to reach them.

21 **4.3 Innovative Financing**

22
23 ENSC recognizes that a lack of upfront capital can be a barrier to customers adopting
24 energy efficiency measures. ENSC's objective is to deliver innovative financing to
25 remove this barrier and increase participation in DSM programs. Financing may be of
26 particular value for capital intensive projects such as those supported by the Existing
27 Residential program, including green heating systems, for example. Different financing
28 vehicles will be available so that a broad spectrum of residential and commercial
29 customers may benefit.

ENSC is evaluating several financing options, including potential opportunities to collaborate with Nova Scotia Power and one or more financial institutions. Key financing program characteristics being considered include:

- longer customer repayment terms that are comparable to the expected life of energy savings
- simplicity of administration for deep retrofit projects, which combine a number of energy efficiency measures
- transferable payment options, such that payment responsibility remains with the beneficiary of energy savings (e.g. the tenant in a rental property which is improved by the property owner but where the tenant pays for heat and/or hot water)
- interest rate buy-downs that make financing rates more attractive to potential borrowers
- convenient customer payment methods, including on property tax bills or on utility bills

No electrical energy or demand savings will be attributed directly to the financing vehicles; savings will accrue to the DSM programs commensurate with the efficiency measures implemented. Financing efforts may also lead to spillover savings, in addition to those attributed to the existing programs.

4.4 Capacity Building

The Capacity Building strategy has the following objectives:

- Build capacity of the energy efficiency industry in Nova Scotia, through the growth of ENSC programs. This growth will lead to increased demand for trained builders, renovators, insulators and installers. ENSC has already seen, and expects to see, continued growth in local energy efficiency industries that supply products such as water heater insulating

blankets, cellulose insulation, heating systems, and high-performance windows and doors. ENSC expects continued growth in Nova Scotia's solid waste reduction efforts through the proper recycling and reclamation of inefficient products such as refrigerators, lights and building materials.

- Provide customers with access to contractors and service providers who are knowledgeable and competent in energy efficiency.
- Provide customers with the ability to identify the most energy-efficient technologies available. ENSC will continue to employ highly-trained program advisors and will provide training to wholesale and retail sales staff.

Building on the experiences of DSM administrators in jurisdictions such as Vermont and Oregon, ENSC's approach is to build a network of trade allies (architects, designers, engineers, builders, contractors, tradespeople, service providers, wholesalers and retailers) and engage them, as appropriate, to meet their needs and enhance their abilities in areas of energy efficiency training, quality assurance and certification. Initial work began in 2011, and efforts will continue in 2012 and beyond.

Initially, ENSC is focusing its efforts in three areas:

- enhancing existing training and quality assurance for its delivery agents
- identifying and assessing needs and opportunities for training and certification through third-party organizations
- working with stakeholders, such as universities, colleges, and professional associations, to develop training programs to address priority gaps and develop capacity to meet future needs

1 ENSC is creating a long-term training and development strategy and beginning
2 implementation via outreach and coordination with educational institutions and other
3 partners.

4
5 To identify, understand, and influence the market channels that support the distribution of
6 consumer products, the following activities will be employed with trade allies:

- 7
8 • Build partnerships with retailers and distributors to stock and promote
9 ENERGY STAR[®] products.
- 10
11 • Work through market channels to influence the supply and pricing of
12 energy-efficient products.
- 13
14 • Work with regional and national alliances, or other partners, to coordinate
15 program activities and share information.
- 16
17 • Identify any gaps in the labeling or identification of high-performance
18 equipment and, to the extent possible, develop solutions for the market.
- 19
20 • Work with bulk purchasers who may bypass traditional distribution
21 channels or make purchase decisions across provincial boundaries.
- 22
23 • Create a trade ally website, with public access for consumers, and a
24 password-protected intranet for trade allies for online training and
25 program updates.

26
27 To qualify, trade allies would receive training on ENSC's mandate and programs and, as
28 appropriate, program-specific, technical training provided by experts in related fields.
29 Other requirements may include installation quality, customer satisfaction and use of
30 high-performance technologies.

Trade allies may benefit in a number of ways. For example:

- Where appropriate, in some of ENSC's future programs, participants may be required to engage network members in order to become eligible to receive incentives (this is already the case for incentives for ground-source heat pumps, which require installers to be members in good standing of the Canadian GeoExchange Coalition).
- ENSC may offer network members marketing benefits, including, for example, references through its website, marketing materials, sales training or other marketing benefits.
- ENSC may organize activities for network members, providing an opportunity to build business relationships and influence ENSC's programs and strategies.

Trade allies have an important role in recruiting customers to ENSC programs. ENSC will continue to educate trade allies and vendors about energy efficiency services so they can communicate those benefits directly to their customers.

4.5 Working with Governments

ENSC's objective is to drive market transformation by promoting energy efficiency, notably through regulatory changes such as energy codes and standards, and building energy labeling, as well as through other government levers.

Collaboration with Municipal Governments

Working with municipal governments across Nova Scotia helps ENSC promote its DSM programs to citizens, building owners, builders, developers, and others. ENSC will continue to work with municipal governments to facilitate participation in relevant energy efficiency programs and to collaborate on specific program offerings, including,

for example, the possibility of offering innovative financing through municipal property taxes.

Codes and Standards

ENSC supports the development, adoption and enforcement of increasingly advanced building energy codes, and equipment and product standards for Nova Scotia. ENSC's role may include:

- identifying and assessing opportunities, providing technical and funding support, continued participation in national or regional committees, and preparing business cases for developing standards that complement ENSC programs
- encouraging the adoption of new model codes and standards through marketing and trade ally engagement
- conducting baseline studies to determine the need for, and value of, contractor training and provincial building code enforcement
- evaluating the amount of energy and demand savings attributable to enhanced codes and standards

Some of the codes and standards activities that are currently underway are described below.

Residential new construction: A new Nova Scotia residential building code, adopted in 2010, will result in energy efficiencies. The code requires all new residential houses to either meet prescriptive requirements (intended to achieve an EnerGuide rating of 80) or demonstrate energy efficiency performance through an EnerGuide rating of 80.

General-service lighting: As a result of feedback from consumer and business groups, the federal government announced a delay of two years in the implementation of the proposed general-service lighting energy efficiency standard, which was due to come into effect on January 1, 2012. ENSC will continue to work with its provincial Department of

1 Energy counterparts to strongly encourage the adoption of the new regulations at the
2 earliest possible date.

3
4 Linear fluorescent lighting: ENSC has been working with the government of Nova Scotia
5 with a view to eliminating inefficient T12 linear fluorescent lighting from the market, and
6 now anticipates that such a standard will be adopted before the end of 2012. ENSC also
7 intends to encourage the development of a further standard that would require that T8
8 lighting systems (lamps and ballasts) sold in Nova Scotia meet high performance
9 specifications.

10
11 Non-residential new construction: ENSC has been working with the government of Nova
12 Scotia, with a view to adopting the National Energy Code for Buildings (NECB) as soon
13 as possible. It is anticipated that a new code could be ready for announcement before the
14 end of 2012, with its savings impact potentially beginning in 2014. ENSC further intends
15 to support the federal government's planned 2016 update to the new NECB, which
16 currently anticipates an additional 25 percent of energy savings.

17
18 LED street lighting: Nova Scotia is introducing regulation requiring the adoption of LED
19 technology to replace current street lighting technologies. It is anticipated that the
20 regulations will be in place later in 2012, with conversion activity being completed within
21 a ten-year period.

22 **Building Labeling**

23 Based on experience gained in Europe, the United States and Australia, a mix of policies
24 may include government lead-by-example labeling and rating requirements for its own
25 buildings and leases, a time-of-sale labeling requirement for residential buildings, and/or
26 some form of disclosure policy for commercial/industrial buildings.

27
28
29 ENSC will develop technical expertise to support market participants and provincial or
30 municipal governments interested in mandatory labeling. The federal government is

1 developing draft voluntary labeling systems for residential and commercial buildings, and
2 ENSC is collaborating so that systems are appropriate to Nova Scotia's needs.

3
4 ENSC also will work with its provincial partners to promote the voluntary use of labels
5 by DSM program participants and organizations, to increase familiarity and expertise
6 with labels and labeling tools. Depending on the level of availability of benchmarking
7 tools and labels, ENSC will incorporate labeling into its programs. ENSC will encourage
8 the adoption of internal labeling policies by the provincial government, municipalities
9 and organizations.

10
11 The strategy includes engaging in discussions with key market participants and agencies,
12 participating in working groups, providing technical and other support as needed, and
13 contributing to research efforts. This work is expected to encourage implementation of a
14 number of measures, including building envelope retrofits, heating systems and new
15 energy management initiatives.

16
17 Labeling activities are not expected to generate immediate savings. Once labeling is in
18 place, it is expected to increase uptake of other DSM programs, potentially reduce the
19 need for incentives, and generate additional savings outside of programs.

REGULATORY OVERSIGHT – A BALANCED APPROACH FOR EFFICIENCY NOVA SCOTIA

Prepared by
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Submitted to:
EFFICIENCY NOVA SCOTIA CORPORATION

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ABOUT DUNSKY ENERGY CONSULTING

Dunsky Energy Consulting is a Montreal-based firm specialized in the design, analysis and implementation of successful energy efficiency and renewable energy programs and policies. Our clients include leading utilities, government agencies, private firms and non-profit organizations throughout Canada and the U.S.



To learn more, please visit us at www.dunsky.ca.

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ABOUT THE AUTHOR

Philippe Dunsky has 20 years of experience in the fields of energy efficiency and renewable energy (EE/RE) programs, plans and policies. Throughout much of his career, he has provided analytical support and strategic counsel to a clientele comprised primarily of leading electric and gas utilities, government agencies, private firms and non-profit organizations throughout North America.

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SUMMARY

Dunsky Energy Consulting was tasked by Efficiency Nova Scotia Corporation (ENSC) with reviewing the oversight framework that currently applies to its Demand-Side Management plans. Specifically, we were tasked with identifying opportunities and recommending changes that could enable greater performance, while ensuring a robust framework of stakeholder consultation and regulatory oversight.

Our review pinpoints a number of strengths from which ENSC currently benefits, and which form a solid foundation for performance. These include most notably the trust that appears to have developed between ENSC and its stakeholders; the organization's clarity of purpose which, among other things, provides a foundation for the aforementioned trust; the growing degree of operational flexibility allowed for by the UARB and stakeholders; and the meaningful budgets that allow the organization to hold some sway in the market.

Our review also focuses on an important hindrance: the limited approval period (twelve months) of its plans. This approval period creates uncertainty in the market, as ENSC is unable to make commitments of longer than a single year to its contractors (who must decide whether and to what extent to invest in building capacity in Nova Scotia), to critical market players (including those who are being asked to provide new products and services to Nova Scotians), to its current and prospective staff (a number of whom may attribute strong value to job security), and to its larger customers (who often plan important investments in their equipment or buildings over several years). The one-year approval period can further lead to missed savings as well as diverted organizational time and focus, especially of senior management.

Given the above, as well as stakeholder comments received during two consultation sessions held in the fall of 2011, we devised a framework that we believe could address much of those concerns without in any way sacrificing the ability of the UARB and stakeholders to continue to ensure effective oversight of ENSC's performance. This framework involves the following characteristics:

1. **Multi-year Plan:** ENSC would submit a multi-year (e.g. five-year) plan, and request **UARB approval for the first three years;**
2. **Annual Progress Reports:** In the intervening years, ENSC would file annual progress reports, and would further be required to file a detailed Corrective Action Plan in the event that evaluated savings fall significantly short of goals;
3. **Ongoing Evaluation:** ENSC's evaluation framework would change to allocate more resources to priority areas, and to provide more timely feedback to program managers as well stakeholders and the UARB;

4. **Quarterly Meetings:** ENSC would meet with UARB representatives quarterly to present and discuss status updates; it would hold similar meetings with stakeholders in order to keep them informed of progress and obtain their input going forward;
5. **Rate Rider Adjustment:** ENSC would largely maintain the current mechanism, using the balance adjustment (BA) of the previous year to adjust the rider, as well as the cost allocation tables reported in the Annual Progress Report and NSPI's most recent sales forecasts by rate class.
6. **ENSC Board of Directors:** Finally, we note that in addition to the regulatory oversight process, ENSC is now governed by an independent Board of Directors (BOD) that adds another layer of governance to the process.

The chart below illustrates the recommended approach, including both the regulatory and extra-regulatory oversight mechanisms.

		THREE-YEAR PLAN																	
		2012				2013				2014				2015				2016	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
REGULATORY	Multi-Year Plan	F→H	A _f											F	H	A _f			
	Progress Reports					F				F								F	
	Evaluation activities					O	O	O	O	O	O	O	O	O	O	O	O	O	
	Meetings, Reports					M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	
	Rate Rider			F	A _f			F	A _f			F	A _f			F	A _f		
ENSC BOD	Multi-Year Plan	A _i												A _i					
	Progress Reports					A _i				A _i								A _i	
	Ongoing Reporting					R	R	R	R	R	R	R	R	R	R	R	R	R	
	Oversight	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

F = filing. H = hearing. M = meeting. R = report. A_i = internal approval (BOD). A_f = final approval (UARB). O = ongoing.
Arrows indicate sequence dependency prior to start of three-year plan.

As can be seen, the regulatory process is designed to maintain a full schedule of evaluations, reporting to the UARB and stakeholders, and opportunity for input. It also involves additional oversight from ENSC's independent board of directors.

We believe that this framework will maintain and may even enhance the ability of the UARB and stakeholders to properly oversee ENSC's work. It will also enhance ENSC's ability to commit to the market and to other critical actors and, as such, improve its ability to perform. We do note, however, that this approach falls short of providing the sort of longer-term certainty currently provided to other organizations similar to ENSC.

INTRODUCTION

MANDATE

Efficiency Nova Scotia Corporation (ENSC) has tasked us with reviewing the current regulatory oversight model and proposing changes that may be useful toward improving the Corporation's ability to assist Nova Scotians in saving energy as efficiently and effectively as possible. ENSC also seeks to ensure that any recommendations in no way diminish the ability of the UARB and stakeholders to track, influence and, ultimately, oversee ENSC's performance.

For the purposes of this report, we consulted with ENSC's Board of Directors and senior management, and program administrators in other regions. We further consulted with ENSC's stakeholders during ENSC-led stakeholder consultation sessions on November 3rd, 2011, and again on December 8th, 2011. These discussions led to changes that were subsequently incorporated into the recommendations herein.

CONTEXT

Regulatory oversight of a dedicated DSM "utility" like ENSC is broadly analogous to regulatory oversight of other monopoly functions. In this respect, regulatory models exist on a continuum, ranging from pure "cost of service" models¹ on one end, to pure "performance-based" models on the other end².

In Nova Scotia, where NSPI's rate setting process has historically followed a broadly cost-of-service model, it is no surprise that regulation of NSPI's initial DSM activities took a similar approach. To this end, NSPI submitted its proposed DSM plans to the Nova Scotia Utility and Review Board (UARB), and the UARB undertook to ensure that the proposed associated revenue requirement was in the interest of ratepayers.

In April 2008, following stakeholder consultation, a report prepared by Dr. David Wheeler proposed a new model for DSM administration and delivery in the province.³ This model, which led to the creation

¹ A "cost of service" model is fundamentally prospective, requiring the regulator to determine, in advance, the revenue required to allow the utility to adequately perform its functions and generate a reasonable return for investors, given an assumed risk profile. The revenue requirement is determined by customer class, and rates are then set based on a forecast of annual sales. A variety of adjustments may or may not occur *ex-post* to account for unforeseen variances.

² "Performance-based" models come in a variety of forms, and may include what are commonly referred to as "rate cap" approaches, "revenue cap" approaches, loose cost-of-service models or hybrids of any or all of the above.

³ David Wheeler, *Stakeholder Consultation Process For An Administrative Model For DSM Delivery In Nova Scotia – Final Report*, April 20th, 2008.

of ENSC, was predicated on the creation of an independent, third-party delivery agency (ENSC), operating under a performance-based contract with the UARB.

Approximately one year ago, in our review of the programs and frameworks ENSC was inheriting, we raised the issue of the oversight model and suggested that it be reconsidered in time for the 2013 plan. With the creation of ENSC and the successful transitioning of programs previously under NSPI administration now complete, we believe more than ever that it is now appropriate to focus attention on the regulatory oversight approach. Indeed, this may be considered as another piece of a puzzle aimed at maximizing the ability of Nova Scotians to access energy cost savings as efficiently and effectively as possible.

CONTENTS

This report is divided into four main parts:

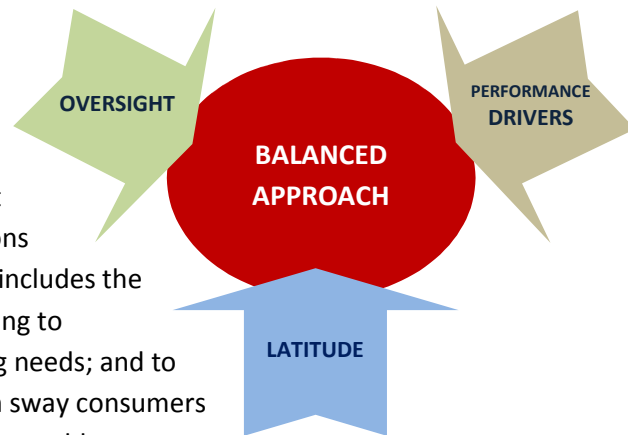
- *Objectives* – a brief discussion of the objectives that we believe should be the focus of any recommended changes;
- *Assessment* – a review of the current regulatory oversight process and its inherent strengths and weaknesses
- *Recommendations* – a presentation and discussion of the changes we recommend for enhancing ENSC’s ability to deliver savings efficiently and effectively, while maintaining the UARB’s and stakeholders’ ability to fully exercise their critical oversight roles.
- *Overview of Proposed Approach* – an overview of the recommended process and a discussion of remaining risks.

Finally, we conclude with a recap of the report’s findings and recommendations.

OBJECTIVES: A BALANCED, EFFECTIVE APPROACH

The purpose of this mandate is to recommend changes needed to arrive at an effective, balanced regulatory oversight approach for ENSC. While these are subjective terms, we have focused on ensuring the presence of three “keys to success”, namely:

- **Performance Drivers:** The approach must ensure that ENSC does not face any disincentives to successful delivery of DSM savings, and indeed has sufficient built-in drivers for maximizing performance;
- **Latitude:** The approach must be careful to ensure that ENSC has all the latitude it needs to effectively move market decisions toward improved energy efficiency. This includes the ability to commit to the market it is seeking to influence; to be responsive to its evolving needs; and to bring sufficient resources such that it can sway consumers and decision-makers toward choices they would not otherwise have made; and
- **Oversight:** The approach must provide sufficient opportunity for regulators, stakeholders and the general public to oversee and ensure the effective use of ratepayer contributions.



Below we address each of these points distinctly.

PERFORMANCE DRIVERS

Efficiency Nova Scotia may have a mandate to generate energy savings, but does it have the internal and external drivers to do so?

In many regions throughout North America, regulators have adopted frameworks meant to achieve two twin goals: remove inherent disincentives to DSM administrator performance, and build incentives meant to positively drive performance. For example, lost-revenue adjustment mechanisms (LRAMs) are a common approach to addressing utility concerns about the impact that successful DSM activities would otherwise have, through reduced sales, on company profits. Similarly, more broad-based “decoupling” mechanisms also seek to address the problem by making utilities “whole” as a result of DSM. Meanwhile, a large and growing number of U.S. states and some Canadian provinces have instituted bonus structures, sometimes known as “shared savings mechanisms”, meant to ensure that shareholder returns increase alongside increased performance on utility DSM goals.

Such mechanisms and incentives are not necessarily required for the DSM administrator to be fully driven to succeed; rather, the issue must be addressed based on the specific context in which the DSM administrator operates. We note of course that contrary to most other jurisdictions in which utility administered DSM is subjected to regulatory oversight, ENSC is a non-utility, not-for-profit entity.

LATITUDE

Even if Efficiency Nova Scotia has the clarity of purpose and built-in incentives to perform, does it have the *ability* to do so to maximum effect?

ENSC operates in an extremely complex market environment, one that is in many respects very different from that of a traditional, regulated utility. Indeed, in every market in which it seeks to influence consumer investments, purchases, and behaviours, ENSC competes with myriad non-energy opportunities for scarce participant time, attention and money. Furthermore, ENSC’s “product”, improved energy efficiency, is discretionary: except in extreme situations, the purchase of energy efficiency improvements (unlike the purchase of electricity, for example) is simply not necessary to live, to run a business or to operate a government.

For example, in the residential sector, ENSC’s efforts at encouraging home energy retrofits compete with sellers of granite countertops, stainless steel appliances and a host of possible “home improvement” projects. Similarly, its efforts at encouraging use of higher first-cost but more efficient lighting products may compete with other discretionary spending, as simple as an evening at the restaurant or a night at the movies.

In the commercial sector, ENSC’s efforts at gaining the time and attention of small business owners can rarely compete with more pressing management priorities, including day-to-day operations. Similarly, its efforts at convincing larger organizations to consider energy efficiency in their procurement policies, where first cost is often the sole cost consideration, can run up against inertia built on years or even decades of management practice in which responsibility for capital and operating budgets sits with different people. The practical experience of hundreds of DSM plans and programs throughout North America provides countless similar examples that affect every sector, every market segment and just about every energy saving measure that DSM administrators are tasked with promoting.

It is for this reason – to compete effectively for customers – that DSM program administrators require sufficient latitude.

A DSM administrator’s latitude – or ability to compete effectively – can in turn be defined as the combination of three factors:

1. **Resources:** *Does the DSM administrator have sufficient market sway (e.g. through incentives) to influence decisions? Ultimately, this is often (though not always) about being able to offer enough of an incentive to convince consumers and market actors to make choices they would not otherwise have made.*
2. **Responsiveness:** *Is the DSM administrator able to quickly and easily adjust to ongoing market dynamics? Can it pounce on external opportunities as they arise; adjust its portfolio and strategies as markets respond (or fail to respond); sufficiently customize its offerings to ensure it is meeting the differing needs of participants.*
3. **Commitment:** *Is the DSM administrator able to commit to the market in such a way as to elicit investments and reciprocal commitments by contractors, trade allies, government and others? This is fundamentally about its reputation and staying power, and can be very difficult if it either has a history of fluctuating budgets/efforts, or if its very existence can be called into question on a regular basis.*

To the extent the answers to each of these are positive, we believe the DSM administrator should have sufficient latitude to maximize effective use of the ratepayer dollars with which it will have been entrusted.

OVERSIGHT

As with any regulatory oversight model, both the regulator and stakeholders should expect to be able to fully and effectively play their roles. This implies that any regulatory approach must strive to achieve three goals:

- **Transparency:** *The regulatory oversight mechanisms should ensure that the regulator and stakeholders are kept apprised of progress, as well as significant challenges or changes, within a reasonable timeframe. While regulatory micromanagement can be harmful, the UARB and stakeholders should not be “left in the dark”; otherwise they would be unable to play their roles.*
- **Safeguards:** *The regulatory oversight mechanisms should provide for safeguards against certain situations such as the misuse of funds or continuous extreme performance issues.*
- **Influence:** *The mechanisms should provide sufficient opportunity for stakeholders to make suggestions and otherwise contribute to DSM plans.*

As we will discuss further in this report, we believe it is possible to respect these criteria for effective oversight, while simultaneously providing ENSC the full latitude it needs to be able to move the market toward greater energy efficiency.

ASSESSMENT OF ENSC'S FRAMEWORK

RECENT ADJUSTMENTS

The regulatory framework to oversee DSM began with NSPI as the interim administrator and transitioned as the DSM administrator role was taken over by ENSC in the fall of 2010. As part of its decision on ENSC's 2012 filing, the UARB accepted certain adjustments to the original framework, most notably:

- **Cost-effectiveness:** Whereas the UARB had previously required that individual measures demonstrate a TRC greater than 1, it accepted ENSC's suggestion that this threshold be moved to the program level;⁴
- **Cumulative savings:** Whereas the UARB had previously taken an annual view of costs and savings, in its decision it considered cumulative savings, including over- or under-achievements from previous years;⁵ and
- **Multi-annual plans:** Whereas the UARB has thus far operated on an annual plan approval basis, it accepted ENSC's request to launch a process, including consulting with stakeholders, aimed at examining the possibility of moving toward a more performance-oriented approach that could involve a multi-year framework. It is important to note that this decision was not meant to provide tacit approval for such a move, but only for its further consideration.⁶

As part of this mandate, we have reviewed the existing framework, with a view to identifying its strengths and weaknesses in terms of the criteria set forth previously. Our findings in this regard are presented below.

⁴ Nova Scotia Utility and Review Board. *DECISION In the Matter of an Application by Efficiency Nova Scotia Corporation for Approval of its Electricity Demand Side Management Plan for 2012*, June 30, 2011. See page 31.

⁵ Ibid, pp. 14-29 and 35-38.

⁶ Ibid, p. 43.

STRENGTHS

While the UARB's oversight of DSM is relatively new as compared to many other regions of North America, both the framework and the approach it has taken to the task offer benefits that others do not have. These include:

1. **Trust.** With the seamless transition of DSM administration from NSPI to ENSC (as an independent, not-for-profit organization), stakeholder relationships and trust have grown. This trust is a key strength upon which Nova Scotia can build a more performance-oriented framework.
2. **Clarity of Purpose:** Utilities often have a difficult time communicating – externally *and internally* – the rationale for reducing sales of their own product. Overcoming the perceived conflict between sales and savings often requires the adoption of a series of corrective or compensatory regulatory mechanisms. The decision to entrust administration of DSM goals with an independent, not-for-profit entity has created clarity of purpose – and an alignment of interests – that can only be beneficial to effective DSM oversight and implementation. Furthermore, not only is the organization exclusively dedicated to its DSM mission, it is overseen by an independent board of directors that acts as an internal performance driver.
3. **Flexibility:** Since its beginnings in Nova Scotia, the UARB has allowed the DSM administrator to be nimble in its approach to the market. For example, while DSM plans have been approved annually, the administrator has been allowed to modify its approach mid-course, in response to changes in the market or to its own understanding of opportunities, with no need to seek prior formal approval. The existence of the Program Development Working Group has notably facilitated this nimbleness, as stakeholders have been kept in the loop and apprised of proposed changes. Furthermore, in its recent decision on the proposed 2012 plan, the UARB agreed to lift the previous measure-level TRC requirement, thereby allowing ENSC more latitude in determining the mix of electricity-saving measures that should be promoted, while ensuring that the overall effort remains cost-effective.
4. **Resources:** In its most recent decision, the UARB approved a DSM plan budget of approximately \$45 million, or roughly 4% of system revenue allocated to DSM. While parties may reasonably argue for higher or lower budgets, this level of resource is significant enough to provide ENSC with a meaningful ability to influence market behaviour.
5. **Long-term View:** Also in its recent decision on the proposed 2012 plan, the UARB agreed to a cumulative savings perspective, in particular by recognizing previous years' over- or under-achievements relative to overall multi-year plan goals and objectives.

These strengths are not insignificant. In particular, it is worth noting that a number of DSM administrators in North America do not benefit from the same level of trust, clarity of purpose, and flexibility. Nonetheless, it also has certain weaknesses that can be addressed going forward.

WEAKNESSES

As we have seen above, the current framework addresses several of the key success factors noted previously, including to a large extent the question of whether ENSC has sufficient performance drivers, and whether it can be sufficiently responsive to market needs.

That said, the current framework suffers from the short-term nature of its funding approval process.

Indeed, while the organization has ostensibly been created with a long-term perspective, it relies on year-by-year approvals for its entire budget. This can create several important barriers to performance, including contracting inefficiencies, lack of market credibility, missed savings opportunities, and diverted organizational focus. We address each of these concerns below.

1. CONTRACTING INEFFICIENCIES

Under the current framework, our understanding is that ENSC is unable to take on most financial commitments for more than a twelve-month timeframe. This year-by-year approach can discourage contractors from providing more aggressive pricing, and can make it more difficult for them to secure subcontractors (or to obtain aggressive subcontractor pricing). Furthermore, a single-year commitment limits ENSC's ability to convince out-of-province contractors to invest in building capacity in Nova Scotia, an important aspect of longer-term market transformation. Finally, a limited commitment timeframe may also hinder the corporation's ability to attract and retain the best talent. While none of these concerns are absolute (ENSC has already attracted excellent staff and contractors), they act as unnecessary impediments to obtaining the best pricing, talent and capacity building that would be possible.

2. MARKET CREDIBILITY

For ENSC to succeed in transforming markets toward greater energy efficiency, it will need to convince a wide array of market actors to invest in new business lines, procurement processes, and other ventures. For example:

- **Training:** To be successful, ENSC will need to convince market actors to invest in training and certification. For example, it may seek to convince energy evaluators, retrofit contractors and HVAC vendors/installers to obtain training and/or certification to ensure that the *promise* of energy savings is actually delivered to consumers. Similarly, it may encourage building professionals to develop new skills and processes, such as integrated design, wherein architects, engineers and energy evaluators work collaboratively at the earliest stages of construction planning to ensure that energy performance is not inadvertently impeded. It may want to encourage training in building commissioning, re-commissioning and retro-commissioning skills. And it may want to convince municipal code assessors, tax appraisers, and real estate agents to

develop the skills required to judge the extent to which homes and buildings are energy efficient. **None of this can happen unless educational institutions and private training organizations invest in new training and certification programs. Yet to make such investments, institutions will seek to be convinced that demand for these services will continue to grow over many years.**

- **Retooling:** To be successful, ENSC will need to convince market actors to invest in the development of new lines of business. For example, it may wish to encourage firms to invest in the provision of Energy Management Information Services (EMIS), or in the development of wood pellet delivery services and infrastructure (including purchase or conversion of trucks). It may work to encourage retailers to develop new product lines, for example selling high-performance, premium ductless heat pumps, or more broadly by procuring, stocking and labeling energy saving products. It will work with financial institutions to develop new energy efficient financing vehicles, including services, terms and credit evaluation processes. **These (and many others) will require the private market to invest in new approaches, new skills and qualifications, and new business ventures, all on the basis of the confidence they have in ENSC's ability to increase market demand for these services over many years.**
- **Consumer processes:** Additionally, ENSC will need to convince consumers to change embedded procurement processes that inadvertently penalize – or simply fail to recognize the benefits of – energy efficient options. For example, ENSC may work with large corporate and governmental organizations to encourage changes to procurement rules for products such as lighting, PCs, and a variety of plug load equipment. Similarly, it may encourage organizations to incorporate energy efficiency in their leased space procurement, and may work with landlords to adjust standard lease contract practices to remove undue barriers to energy efficient retrofits. ENSC may also want to work with industry and large corporations to promote adoption of energy management continuous improvement processes (e.g. ISO 50000), and/or energy benchmarking (e.g. through Energy Star Portfolio Manager). **Since these are not “quick-hit” equipment replacements, they do not lend themselves to one-time incentives as much as they do to a committed, multi-year effort. In many cases, customers will want to know that ENSC can support them throughout the entire process.**

As with contracting, none of these goals are impossible within the current twelve-month process. Indeed, ENSC may well be able to convince certain training institutions to develop new programs; certain trade allies to consider retooling and/or offering new services; and certain consumers to rethink their procurement practices. However, ENSC's inability to formally commit to them over a multi-year timeframe will hinder its ability to bring these changes to the broadest possible swaths of the market.

3. MISSED SAVINGS OPPORTUNITIES

ENSC's current 12-month approval process can act as a disincentive to securing certain energy savings opportunities, both short- and long-term.

For example, there may be opportunity within a program that incorporates targeted, on-site visits, to set aside a small amount of additional time to identify and record savings opportunities that cannot be pursued immediately, but that ENSC could follow up on in the subsequent year. Yet contractors acting on a single-year mandate do not have incentive to generate and record such leads, as they will incur the cost but the benefit may accrue to another contractor. Similarly, contractors have little if any incentive to push upstream activities such as training that may be likely to generate sales in future years; as a result, they are likelier to rely more heavily on more expensive, "resource acquisition" strategies.

4. DIVERTED ORGANIZATIONAL FOCUS

The regulatory process can consume significant organizational time, energy and focus. Indeed, from the priority attention given by senior management, through to the attention and time required of staff, as well as the costs involved in procuring legal and external consultant services, the process can be demanding. All of that time, effort and attention results in both direct costs, and in lost opportunities in terms of organizational performance and focus in delivering DSM.

CONCLUSION

The current regulatory framework presents a number of important characteristics that enable effective DSM implementation. However, the short, one-year approval timeframe hinders the corporation's ability to commit to the market, consumers and partners, which in turn likely creates an important impediment to its ability to help transform markets toward greater energy efficiency. The time and organizational attention focused annually on the full regulatory process may also divert from the corporation's ability to deliver DSM savings.

The table below summarizes our findings.

CRITERIA:	PERFORMANCE DRIVERS		LATITUDE			OVERSIGHT			
Components	No Disincentives	Incentives	Resources	Responsiveness	Ability to Commit	Transparency	Safeguards	Influence	Cost
Examples	Are profits unaffected by sales? Is there clear purpose?	Does Sr. Mgt. have incentive to succeed?	Is budget meaningful to market?	Do any rules impede flexibility?	Can ENSC commit over long-term?	Is reporting timely and sufficient?	Can problems get out of control?	Can UARB / stakeholders influence?	Is the regulatory cost reasonable?
ENSC now	●	◐	●	●	○	●	●	●	◐
Notes	ENSC has no sales disincentive (not a utility)	Mgt. reputational incentive is strong	Budget on higher-end of typical range (aligned with higher-end goals)	Historic flexibility; measure-level TRC removed last year	Annual, single-year approval process a significant impediment	UARB meetings; PDWG meetings; Annual plan filings	Annual process leaves little room for runaway problems	UARB meetings; PDWG meetings; Annual plan filings	Direct and opportunity cost for ENSC not insignificant

● Fully addressed ◐ Partially addressed ○ Challenge remains

The following section will provide recommendations to address the shortcomings we've identified, while maintaining the inherent strengths in the current process. We reproduce the table above as it pertains to the resulting *proposed* oversight framework on page 19.

RECOMMENDATIONS

INTRODUCTION

The electricity context in Nova Scotia is evolving, with the preservation of large industrial loads in flux, the pending arrival of new shipbuilding activity that could increase other loads, potential new renewable electricity supplies, and a forthcoming update to NSPI's Integrated Resource Plan that should seek to account for these and other changes since the previous 2009 IRP Update. Any proposed changes to the regulatory framework must be mindful of these shifting sands.

We have previously noted the importance of long-term market commitments. This is underscored by recent decisions at the only two organizations in North America with a mandate and context as similar to those of Efficiency Nova Scotia. Indeed, the Energy Trust of Oregon recently had its *base* funding commitment approved for an additional fifteen-year period, such that it can engage the market with the assurance of funding through to 2025. Similarly, Efficiency Vermont recently moved from a six-year to a twelve-year contract period, again providing long-term stability and predictability.

Our preferred approach for Efficiency Nova Scotia would involve a similar long-term funding commitment. However, we have chosen to take an evolutionary approach to our recommendations below, opting instead for what we believe to be relatively simpler changes that can nonetheless provide considerable value toward ENSC's ability to effectively engage markets.

Below we present a six-part framework, much of which already exists and some of which represents change relative to current practice in the province.

#1. MULTI-YEAR DSM PLAN FILING

In order to improve ENSC's ability to contract efficiently, to build capacity within Nova Scotia, to effectively engage trade allies and large organizations, and to focus more organizational effort on DSM delivery, **we recommend moving to a multi-year planning process.**

Specifically, we recommend that ENSC prepare and seek UARB approval for a 3-year DSM plan that would include two additional years of DSM outlook (for directional information purposes; not for UARB approval). This rolling approach is designed to provide the UARB and stakeholders with the comfort associated with a relatively short period between formal plan authorizations, while allowing ENSC to continue to operate within – and communicate to the market – a clearly defined vision and plan, even as the approval period nears its end.

The multi-year plan should clearly describe the corporation's vision and strategic outlook; should describe the approach it intends to take to achieving savings within its target markets; should provide a

forecast of annual costs (budgets) and energy savings; and should provide a high-level evaluation plan indicating when and how its activities will be evaluated, as well as a timetable for reporting those results. The plan would be subject to a full-scale regulatory hearing, as is currently the case.

#2. ANNUAL PROGRESS REPORTS

In order to provide both the UARB and stakeholders with the information needed to track the corporation's progress, to keep all parties apprised of any changes or risks that may arise, and to safeguard against unforeseeable problems that could otherwise get out of control, **we recommend adopting an Annual Progress Report filing.**

Specifically, the Progress Report would be filed every intervening year between multi-annual plan filings, and would normally be subject to a paper review. The report would provide parties with a summary of the context, activities and milestones achieved over the year prior; would provide a Management Discussion and Analysis of any major discrepancies relative to the original plan's intent and forecasts; and would provide a summary report of costs and savings per program or market area.

It is important to note that the report on savings would provide the most up-to-date information available. The report should be clear as to the nature of the savings presented. For example, some values may be preliminary estimates based on tracked measure implementation and previously-adopted deemed savings; others may incorporate preliminary or final free ridership or spillover values; and yet others may have been subject to verification, to measurement (for some C&I projects), or to billing analysis (for some residential projects). Whatever the state or source of the information, it should strive to follow the initial evaluation plan.

In order to safeguard against the possibility of savings going significantly off-track, we further recommend that the UARB adopt a trigger mechanism. Under this trigger, if reported results fall below 75% of the original plan's forecast cumulative annual incremental savings up to that point, ENSC should be required to file a comprehensive Corrective Action Plan. This plan would detail the changes that ENSC intends to make to correct the situation and ensure that it can achieve its cumulative savings goal by the end of the third year.

The Annual Progress Report filing is intended to be a paper filing for information purposes. Stakeholders and UARB should have the opportunity to ask questions and, if necessary, make suggestions going forward. It could take place toward the end of the first quarter following each calendar year.

#3. EVALUATION ACTIVITIES

In order to measure ENSC's performance toward its objectives, to facilitate allocation of DSM costs to rate classes, and to improve and inform program delivery through rapid and reliable feedback, **we**

recommend that ENSC adjust its EM&V schedule to an ongoing (as opposed to annual “all-in-one”) process.

As indicated previously, evaluation activities can be comprised of a number of different components. Currently, ENSC submits a complete evaluation of all of its programs and activities on an annual basis, and within barely 60 days of the end of the calendar year. This approach has several problems: first, it creates a “rushed” timeline for evaluation activities that does not easily accommodate certain types of projects or evaluation methodologies (e.g. billing analysis). Second, it provides no value to program implementers through the course of the year, as they must wait until the year is over to receive the otherwise valuable feedback evaluations can provide. And third, it inadvertently ensures that negligible or no spillover can be found, since spillover typically takes place after a certain time lag.

We recommend moving toward a layered approach. This approach would be comprised of ongoing tracking (as is currently the case); ongoing, “rapid-fire” free ridership surveys on a number of programs and activities (those that lend themselves to this approach); and a rolling schedule of full-scale evaluations (including verification activities as well as measurement and/or billing analysis, as appropriate), including ex-post spillover surveys. This approach would provide more timely information for program managers, contractors, stakeholders and the UARB:

- Quarterly reports would provide preliminary net-to-gross values, based on a combination of tracked data, initial NTG estimates, and updated free ridership from quarterly surveys;
- Initial Annual Progress reports would provide more advanced values, incorporating the results of more comprehensive evaluations of many program areas; and
- Subsequent Annual Progress reports would provide further adjustments to the previously reported values, as the results of additional work, including spillover surveys, come in. These adjustments would improve the accuracy of the cumulative savings estimates.

#4. QUARTERLY MEETINGS & REPORTS

In order to maximize transparency, to ensure that stakeholders and the UARB are kept apprised of results as they evolve, and to provide opportunity to discuss concerns and/or make suggestions to ENSC, **we recommend a schedule of quarterly meetings with both the UARB and stakeholders.**

The quarterly meetings with the UARB are currently ongoing; we recommend no changes to the process.

The meetings with stakeholders currently take place under the auspices of the Program Development Working Group. Since the group’s original purpose was to assist in program development when DSM was in its infancy, we suggest moving toward a DSM Advisory Group approach meant to focus more on receiving status updates and discussing strategic issues and concerns. It is our understanding that this is the current PDWG’s intention as well.

In both cases, we recommend that the latest savings reports be distributed prior to the meetings.

#5. RATE RIDER ADJUSTMENTS FILING

To facilitate an annual adjustment of the DSM rate rider, **we recommend that ENSC file the annual rate rider adjustment following the current process that has been applied by NSPI to date.**

As is currently the case, the process would be used to annually adjust the rate rider with the balance adjustment (BA) of the previous year, along with the projected costs of the upcoming year.

These projected costs for the upcoming year will be based on updated preliminary cost allocation tables as reported in the annual Progress Report filing, but revised with the most recent NSPI sales forecasts by rate class.

#6. ENSC BOARD OF DIRECTORS

While not formally a part of the regulatory process, we believe it is worth noting that ENSC's independent board of directors (BOD) plays an additional – and in fact crucial – role in the overall schedule of oversight and governance. Indeed, the board of directors is tasked with the sole purpose of ensuring that ENSC accomplish its DSM and energy savings mandate efficiently and effectively. The BOD reviews and approves draft plans and holds ENSC's executive accountable to deliver on results.

OVERVIEW AND DISCUSSION

OVERVIEW OF PROPOSED PROCESS

The following table provides an overview of the oversight process we have recommended, while also indicating the extra-regulatory oversight involved.

		THREE-YEAR PLAN																	
		2012				2013				2014				2015				2016	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
REGULATORY	Multi-Year Plan	F → H A _f												F	H A _f				
	Progress Reports					F				F								F	
	Evaluation activities					O	O	O	O	O	O	O	O	O	O	O	O	O	
	Meetings, Reports					M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	M,R	
	Rate Rider			F → A _f				F	A _f			F	A _f			F	A _f		
ENSC BOD	Multi-Year Plan	A _i												A _i					
	Progress Reports					A _i				A _i								A _i	
	Ongoing Reporting					R	R	R	R	R	R	R	R	R	R	R	R	R	
	Oversight	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

F = filing. H = hearing. M = meeting. R = report. A_i = internal approval (BOD). A_f = final approval (UARB). O = ongoing.

Arrows indicate sequence dependency prior to start of three-year plan.

As can be seen, the regulatory process is designed to maintain a full schedule of evaluations, reporting to the UARB and stakeholders, and opportunity for input. It also involves additional oversight from ENSC's independent board of directors.

STRENGTHS AND WEAKNESSES

Through this process, we have sought to address the remaining weaknesses identified previously, while maintaining its inherent strengths, including the strength of the UARB's and stakeholders' ability to ensure effective oversight. The following table summarizes the extent to which our recommendations seek to address these issues.

CRITERIA:	PERFORMANCE DRIVERS		LATITUDE			OVERSIGHT			
Components	No Disincentives	Incentives	Resources	Responsiveness	Ability to Commit	Transparency	Safeguards	Influence	Cost
Examples	Are profits unaffected by sales? Is there clear purpose?	Does Sr. Mgt. have incentive to succeed?	Is budget meaningful to market?	Do any rules impede flexibility?	Can ENSC commit over long-term?	Is reporting timely and sufficient?	Can problems get out of control?	Can UARB / stakeholders influence?	Is the regulatory cost reasonable ?
ENSC now	●	◐	●	●	○	●	●	●	◐
ENSC proposed	●	●	●	●	◐	●	●	●	●
Notes	ENSC has no sales disincentive (not a utility)	ENSC BOD holds executive accountable to perform.	Budget on higher-end of typical range (as are goals)	Historic flexibility; measure-level TRC removed last year	Move to 3-yr approval; still missing longer-term predictability	Quarterly reports / meetings; Annual report filing; triennial full process	See Transparency; also 75% trigger for detailed Action Plan	See Transparency	Direct and opportunity cost for ENSC significantly reduced.

● Fully addressed ◐ Partially addressed ○ Full challenge remains

RISKS

While we believe the recommended approach can optimize the interests of the UARB, stakeholders and ENSC, we recognize that no single mechanism can fully address all needs and scenarios. Indeed, the Nova Scotian electricity context is rapidly evolving, including significant uncertainty regarding its extra-large industrial loads and their impact on NSPI's future planning requirements. Additional uncertainty, not specific to Nova Scotia, includes the schedule of adoption of new codes and standards, which can impact overall savings in a number of ways depending on their extent and timing, as well as the federal government's approach to regulating greenhouse gas emissions, which could impact NSPI's planning framework. The approval of a multiyear plan therefore raises the question of whether and to what extent the UARB will be able to ensure a dynamic and timely adjustment to evolving "facts on the ground".

We recognize that no single mechanism can fully address all needs and scenarios. We therefore note that, should the Nova Scotian context require material change to ENSC's plans, the UARB will retain full discretion to adjust accordingly. For example, should codes and standards not evolve as expected, the UARB may decide, in the context of ENSC's Annual Progress Report filing, to adjust its expectations of cumulative savings (upward or downward) going forward. Similarly, should a new IRP indicate a need for either significantly increased or decreased savings, the UARB may choose to advance the schedule for the following three-year plan, and ask ENSC to submit either a more or less aggressive proposal. In this latter case, the UARB will presumably give due consideration to the impact that an unplanned budget reduction would have on ENSC's commitments to contractors, market actors or consumers, as well as to its long-term reputation.

CONCLUSION

The regulatory framework that oversees Efficiency Nova Scotia Corporation includes a number of important strengths, including most notably a culture of focusing on results rather than micromanaging operations. Furthermore, the UARB has recently adopted changes meant to provide more flexibility to ENSC, a key component of its ability to perform. This evolving oversight approach is a positive factor in Nova Scotia's ability to meet its aggressive DSM goals.

Nonetheless, the Corporation remains hampered by the very short-term nature of the current approval process. While this is not an insurmountable barrier to delivery of energy efficiency services, it does impose constraints that make it more difficult to achieve its goals. Most significantly, this barrier limits ENSC's ability to engage and indeed to sway the full array of market actors, who ultimately hold the key to Nova Scotia's ability to improve its long-term energy performance.

We have developed a series of proposals that seek to minimize these constraints – and in so doing strengthen ENSC's position in the market. We have done so with a view to avoiding any undue impact on the UARB's and stakeholders' ability to conduct their important oversight roles. This has been done primarily by offsetting the proposed longer lag time between plan approvals by a series of mechanisms, including annual progress reports, more robust *ongoing* reporting, and a protective trigger mechanism in case of significant performance setbacks.

While we believe this approach can optimize the interests of the UARB, stakeholders and ENSC, we recognize that no single mechanism can fully address all needs and scenarios. For this reason, the UARB should of course maintain full discretion should exogenous events require a material change in course.





Efficiency Nova Scotia Corporation Cost Allocation Report

**Prepared by
Elenchus Research Associates Inc.**

February 2012



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Attachment 1: Derivation of Allocated Costs

Attachment 2: Preliminary DSM Rate Impacts

Attachment 3: Bill Impacts by Rate Class

1 INTRODUCTION

Efficiency Nova Scotia Corporation (“ENSC”) filed its first Electricity Efficiency and Conservation Plan, known officially as the Demand Side Management Plan for 2012 (“2012 DSM Plan”) on February 28, 2011. The 2012 DSM Plan included a Preliminary Program Cost Allocation for allocating electricity DSM costs to NSPI ratepayers in accordance with the DSM Cost Allocation Approach approved by the Board on August 4, 2009. In its June 30, 2011 Decision, the Nova Scotia Utilities and Review Board (“UARB” or “Board”) confirmed the continuation of this DSM cost allocation approach in 2012.

In its June 30, 2011 Decision, the Board ordered ENSC to develop and file, no later than September 30, 2011, its policy to track time and costs for electric and other fuel mandates. Pursuant to that direction, ENSC filed a report prepared by Elenchus Research Associates (“Elenchus”) on September 30, 2011, describing the approach that it was developing for ENSC’s cost allocation model. This approach has been implemented by ENSC for purposes of determining the allocation of costs to ratepayer and taxpayer funded programs for its 2011 financial statements.

On December 19, 2011, the Board ordered ENSC to lead the review of the DSM cost allocation approach for allocating DSM costs to NSPI ratepayers in consultation with the stakeholders, and file its proposed methodology coincident with the filing of its 2013 DSM Plan.

The June 30, 2011 Board Order also directed ENSC to undertake the necessary consultation to provide enhanced information on rate and bill impacts in future proceedings.

In response to the Board Orders, ENSC retained Elenchus to:

- 1) Assist it in developing the cost allocation model (“CAM”) to fully allocate its costs to taxpayer-funded programs and ratepayer-funded programs. Integral to this work has been the development of an appropriate “policy to track time and costs for electric and other fuel mandates.”

- 2) Lead the review of the DSM Cost Allocation Approach to electricity ratepayer classes, in consultation with the stakeholders, to be considered for implementation for the 2013-2015 Plan years.
- 3) Prepare the “Preliminary Program Cost Allocation Tables” for filing with the 2013 - 2015 DSM Plan.
- 4) Conduct an analysis of the projected rate and bill impacts of ENSC’s DSM programs for NSPI’s ratepayers based on the cost projections contained in the 2013 - 2015 DSM Plan.

Section 2 of this report summarizes the stakeholder consultation process, which included presentations and discussions of the cost allocation methodology. Section 3 outlines the principles on which ENSC’s cost allocation methodology is based. Section 4 provides an overview of the methodology. Section 5 presents the preliminary DSM program cost allocations and projected rate and bill impacts for the 2013 – 2015 DSM Plan. A summary of recommendations is in Section 6.

2 REVIEW OF ENSC’S COST ALLOCATION PROCESSES

Elenchus reviewed the financial and regulatory requirements that have determined the approach taken to developing ENSC’s cost allocation model. In conducting this review, Elenchus observed that ENSC’s requirements differ from those of a typical regulated distribution utility in several ways, most notably:

1. ENSC’s total program costs, including general administrative costs, are split between taxpayer and ratepayer funded programs. A single cost allocation model is required although only the ratepayer funded programs are subject to regulatory scrutiny and only ratepayer funded costs are allocated to customer rate classes with regulated “rates” (i.e., the rate rider).
2. The allocation of ENSC’s actual costs to ratepayer and taxpayer funded programs is required for ENSC’s annual financial statements; hence, that allocation by general ledger account is reviewed by ENSC’s auditors.

3. ENSC's CAM is used to establish the true-up adjustments that ensure that ratepayer funded program costs are collected correctly from each NSPI rate class once actual program costs have been determined.
4. The CAM is not used to determine the preliminary cost allocation since the budget for future years is not established in the detail required as input to the model. The preliminary cost allocation is based on the planned program costs, which include an allowance for ENSC budgeted administrative costs.
5. ENSC is expected to adjust its program delivery in response to on-going results and identified opportunities; hence, the true-up is needed to ensure that program costs are collected from the appropriate customer classes in a manner that reflects actual system and participant benefits.
6. Unlike regulated electricity and natural gas distributors, ENSC is not a capital intensive enterprise and it does not operate facilities that are used in common by the customers it serves. Most expenditures relate to specific identifiable programs and most programs relate to specific customer classes.

Given these unique characteristics, Elenchus has developed a CAM that differs significantly from the typical CAM used by regulated electricity and natural gas distributors. The ENSC CAM does nevertheless adhere to the same principles, primarily the allocation of costs in a manner that reflects cost causality. The principles on which ENSC's CAM is based are discussed in the next section.

Elenchus has developed a cost allocation model that consists of two parts:

- Part One allocates all cost to programs so that the total costs of ratepayer-funded and taxpayer-funded activities can be determined; and
- Part Two allocates the ratepayer-funded DSM program costs (EDSM) to NSPI customer classes.

Part One of the CAM uses the methodology that was filed initially with the UARB on September 30, 2011, with additional information provided on Oct.14, 2011. This part of the model is being used to prepare ENSC's audited financial statements for 2011. The

same model will be used for allocating costs to ratepayers and taxpayers for ENSC's audited financial statements in future years.

Part Two of the model will be used for the rate rider adjustment commencing with the 2013 program year. It will establish the true-up adjustments for the NSPI rate riders to recover the total costs (including allocated costs) based on ENSC's actual expenditures. This part of the model is consistent with the DSM Cost Allocation Approach that is in place for the years 2010, 2011 and 2012 as set out in the 2009 Settlement Agreement with one exception, as noted below.

The approach being taken by Elenchus in developing ENSC's CAM and in recommending changes to the DSM Cost Allocation Approach was presented to stakeholders for comment and feedback at the two Stakeholder Sessions conducted by ENSC in November and December 2011.

- Mr. Todd's presentation at the November 3, 2011 Stakeholder Session outlined the approach and discussed options for allocators. In addition, separate meetings were held in person and by telephone to provide further briefings on the methodology to stakeholders and their expert advisors who were unable to attend the November 3 session. The purpose of this stage of the consultation process was to survey the views of stakeholders prior to finalizing the CAM.
- At the December 8, 2011 Stakeholder Session Mr. Todd presented the preferred options for allocating ENSC's costs. The purpose of this session was to ensure that the stakeholders had an opportunity to raise any concerns about the approach that was being implemented in developing the CAM.

Two issues received the most attention during the stakeholder sessions:

1. The weighting to be used in allocating costs on the basis of System Benefits and Participating Class Benefits: There was broad acceptance of the Elenchus recommendation to maintain the 25%/75% split that was agreed to by stakeholders in the 2009 Settlement Agreement for use in 2010, 2011 and 2012.

2. The allocator to be used for Enabling Strategies: There was general support for the recommendation to replace the current allocator (customer count) and instead allocate these costs using the System/Participant Benefit approach where feasible, or using total other program costs as the allocator where participating classes are not practical to identify.

Elenchus therefore recommends the following based on its review of the current ENSC Cost Allocation Approach.

Recommendation #1: EDSM costs should continue to be allocated to NSPI rate classes for purposes of determining the preliminary and final rate riders with:

- **25% of costs being allocated on the basis of system benefits, and**
- **75% of costs being allocated on the basis of participating class benefits.**

This approach was accepted in the 2009 Settlement Agreement on the basis that it resulted in a reasonable division of costs and benefits between participating and non-participating classes. The premise of this approach is that no customer class should be made worse off as a result of the implementation of the DSM Plan.

Recommendation #2: Enabling Strategies costs should be allocated using the same System/Participant Benefit approach that is used for other programs. Hence, 75% of costs of the Enabling Strategy would be allocated on the basis of the customer classes that are expected to benefit from the Enabling Strategy where those “participants” can be reasonably identified. For Enabling Strategies where it is not practical to identify the participating (or benefiting) customer classes, the Participant Benefit costs (75% of the costs of the Enabling Strategy) should be allocated on the basis of the proportional allocation of all other program costs to the customer classes.

This treatment of Enabling Strategies that target specific customer classes maintains consistency with the treatment of other program costs. In the case of Enabling Strategies that target or benefit all customer classes, it is assumed that all customer classes will benefit in proportion to ENSC’s total expenditures on the other DSM

programs. Because Enabling Strategies are intended to enhance the results of DSM programs generally, program costs are a suitable proxy for the Participant Benefits of these Enabling Strategies.

It is recommended that this approach be implemented for allocating EDSM costs to customer classes commencing with the 2013 Plan year.¹

3 PRINCIPLES ON WHICH THE ENSC CAM IS BASED

The goal in developing the ENSC cost allocation model has been to ensure that it is compliant with Generally Accepted Regulatory Principles and with standard Canadian regulatory practices. The “philosophy” of the cost allocation methodologies used by regulators as a basis for setting rates differs somewhat from normal accounting practices.

- First, all Direct, Support and Administration Costs must be allocated to the programs and/or customer classes. This is referred to as fully allocated costs.
- Second, costs are allocated in a manner consistent with the cost causality principle. That is, each program/class is responsible for the costs they directly or indirectly “cause”, including the indirect causality of overhead costs.
- Third, accounting costs are not tracked precisely by program/class. Rather, costs categories are pooled and allocated to classes on a proportional basis using allocators, such as head count, energy savings, direct program costs, etc. The allocator used for any particular cost item is the allocator that best reflects the way the costs are “caused”. Since the causal relationship between some cost items and the programs/classes cannot be meaningfully determined (e.g., Board of Directors expenses), those costs are allocated across programs/classes using

¹ Note that the allocation of EDSM costs to customer classes for the years 2010, 2011 and 2012 will continue to be based on the DSM Cost Allocation Approach that was accepted in the 2009 Settlement Agreement.

an allocator that is deemed to be reasonable and fair (e.g., in proportion to all other costs).

In the regulatory context, cost allocation models are generally used to set rates for regulated utilities such as electricity and natural gas distributors. Typically, only a small proportion of their costs can be allocated directly to customer classes because the vast majority of assets (and the related operating and maintenance costs) are shared across customer classes. These are referred to as joint or common costs. For example, an electricity distributor's network carries power to all customers over the same facilities. Hence, based on the cost causality principle, the costs associated with building facilities to meet peak demand requirements are allocated to customer classes based on the peak demands of the classes.

Unlike most regulated utilities, ENSC has few common costs; hence, most of its costs can be directly allocated. The primary exception is its Administrative Costs. Like regulated utilities, the causal relationship between programs/classes and admin costs is not easily determined; hence, the allocation is most reasonably based on an allocator that acts much like an across-the-board mark-up for administrative overheads.

Given this approach, the most significant issue in developing the ENSC CAM is ensuring that the accounting information that is used to directly allocate Program and Support Costs to the individual programs (and in the case of costs to be recovered from NSPI ratepayers to NSPI customer classes) is credible. In particular, the goal is to rely on detailed invoicing information to the greatest extent possible. Where judgement is necessary to establish the relationship between program costs and the Business Segment (i.e., ratepayer/taxpayer, formerly referred to as electricity/non-electricity), it is important to examine reasonable and cost effective options for supporting the allocation with empirical analysis or relevant proxies (e.g., the proportion of homes heated with electricity versus other energy types).

4 COST ALLOCATION METHODOLOGY: OVERVIEW

ENSC's cost recovery methodology requires it to recover the actual costs incurred for its programs from the customers that benefit from those programs. This is accomplished through a two-stage allocation methodology that first allocates all costs to programs so that the costs attributable to ENSC's ratepayer-funded programs (EDSM programs) and its taxpayer-funded programs (PNS) are appropriately determined. The second stage allocates the costs associated with ratepayer funded programs to NSPI's rate classes.

Since actual program activity and costs typically deviate from the initial expectations due to uncertainty in consumer response to incentives and marketing, ENSC's EDSM costs are recovered through an initial rate rider plus an after-the-fact true-up mechanism that ensures that costs are recovered from each customer class on the basis of actual rather than forecast costs.

The preliminary cost allocation is established using the program cost estimates provided as set out in ENSC's 2013-2015 DSM Plan (Appendix A). These cost estimates include administrative costs using a generic mark-up percentage rather than the more detailed cost allocation methodology contained in the CAM. This simplified approach to setting the initial rate rider is necessary since the level of financial detail required as input data for the CAM is not available on a budget basis. These projected costs have been used as the basis for the cost information contained in this filing and for deriving the projected rate riders and rate impacts for 2013–2015.

The CAM is used once ENSC's audited financial statements have been finalized to determine the actual costs of EDSM programs that should be recovered from each NSPI customer class.

ENSC's cost allocation model relies on standard fully allocated costing concepts that are generally accepted by Canadian regulators for rate-setting purposes. In particular, ENSC's fully allocated costing methodology allocates 100% of costs to the "customer classes" based on cost causality principles. The concept of customer classes differs somewhat from most regulated utilities (such as electricity and natural gas distributors) since ENSC has two tiers of "customer classes":

- The first tier of “customer classes” is the division between taxpayers and ratepayers, where the taxpayer “class” is defined in terms of programs that are funded by taxpayers through government contracts and the ratepayer “class” is defined in terms of programs that are funded by NSPI ratepayers.
- The second tier of customer classes relates only to ratepayer-funded programs. Costs that are allocated to (and recovered from) NSPI ratepayers must also be allocated by the model to NSPI ratepayer classes.

The Board’s direction in its June 30, 2011 Order relates only to the first tier; that is, the allocation of costs to taxpayer- and ratepayer-funded programs. While this report focuses on the first-tier methodology, it should be noted that once costs are allocated to programs, most EDSM costs will be directly allocated to NSPI rate classes.

In order to allocate cost to the electricity and other fuel mandates within the ENSC CAM, ENSC’s accounts have been divided into several categories that require different allocation methods:

1. **Direct Program Cost Accounts:** A few accounts can be directly allocated to a single ENSC program. This occurs in cases where the definition of the account is such that all expense (or revenue offsets) must be allocated to a single program. For example, the Small Business Energy Solutions (SBES) Recovery is allocated directly to the SBES program.
2. **Joint Direct Program Cost Accounts:** Some accounts contain costs that can be directly allocated to programs but it is necessary to allocate the costs in the account to two or more programs (for example, joint costs such as certain marketing expenses) that must be divided between programs. The appropriate allocation of these costs to specific programs is determined on an invoice-by-invoice basis by ENSC staff whenever sufficient information is available to break

down the invoiced amount accurately.² An example of this approach is certain marketing expenses that are incurred for the C&I group on behalf of multiple programs. In instances where the amounts related to specific programs are not known, the expenses are allocated to programs using a broad-based allocator (FTE or Direct Costs). In the future, ENSC accounting staff will continue to seek improved information so that the residual amount allocated using broad based allocators can be minimized.

3. **Common Program Cost Accounts:** One account (bad debt expenses – the rate rider component of electricity invoices unpaid by customers) contains common costs that are “caused” by the ratepayer-funded programs in common. That is, these costs cannot be said to be caused by specific ratepayer-funded programs, but are caused by all of these programs together. Hence, while the costs can be directly allocated to ratepayer-funded programs and recovered exclusively from NSPI ratepayers, it is allocated to individual electricity programs on a proportional basis.
4. **Administrative and Operational Overhead Accounts:** Several accounts contain expenses that relate to ENSC’s office space or business operations and are not directly “caused” by ENSC’s programs. These are typically defined as “common costs” in cost allocation models that should be allocated across classes on an appropriate proportional basis. Examples include rent, insurance, and janitorial service, as well as expenses related to ENSC’s Board of Directors. These common costs are allocated to all ENSC’s programs on a pro rata basis. Two allocation methods are used:
 - 4.1 **Common Costs (Staff/Space):** Costs that are “caused” by the number of staff in the office (or the total office space, which in turn is “caused” by the number of staff) are allocated to programs on the basis of headcount (i.e.,

² In general, the necessary information to correctly allocate the costs is provided on the invoices received by ENSC. Where a supplier does not currently provide the necessary detail of costs by program, ENSC will require more detailed information to be provided on the invoices in the future. ENSC is striving to eliminate the need to rely on staff judgement to allocate joint costs across programs wherever it is practical to do so.

full-time equivalent, or FTE, associated with each program). Accounts allocated in this way include rent, insurance and IT equipment.

- 4.2 **Common Costs (Operations):** Other common costs in the administrative and Operational Overhead category are not related to the number of staff or space but by the overall business activity. Examples include ENSC Board of Directors' fees and bank charges. These expenses are allocated to programs (and hence to the electricity and other fuel mandates) on the basis of the total directly allocated costs of each program. In effect, these costs are treated as a fixed percentage adder on the direct costs of the programs.
5. **General Program Administration Cost Accounts:** A number of accounts contain both administrative expenses that are "caused by", and can be directly allocated to, programs - either individually or jointly - and administrative expenses that are "caused by" the general administrative operations. Examples of this category of costs include office supplies, travel and staff training. Costs in these accounts are allocated using two methods:
 - 5.1 **Program expenses:** Costs that are associated with ENSC's programs, such as office supplies used by program staff, are allocated using the methodology described above for Joint Direct Program Cost Accounts.
 - 5.2 **Administrative expenses:** Costs that are associated with ENSC's general administrative operations are common administrative costs. These costs are transferred to the Common Costs (Operations) category included in Administrative and Operational Overhead Accounts and are, therefore, allocated in the same way as those costs (i.e., allocated to programs and, hence, to the electricity and other fuel mandates on the basis of the total directly allocated costs of each program).

Salaries and Benefits Accounts: The various accounts that make up total ENSC salaries and benefits contain both expenses that are caused directly by the programs (e.g., salaries of program managers) and expenses that relate to ENSC's office administration (e.g., executive, accounting and support staff

salaries). These accounts are allocated to programs based on the number of full-time equivalent (FTE) staff assigned directly to each program

5 PRELIMINARY PROGRAM COST ALLOCATION FOR 2013 - 2015

This section contains the Preliminary Cost Allocation and the Preliminary Bill and Rate Impacts for the years 2013, 2014 and 2015.

5.1 PRELIMINARY ALLOCATION OF DSM COSTS

Tables showing the preliminary allocation of DSM program costs to rate classes are provided in the Attachment 1. To prepare these costs, Elenchus used the 2013-2015 DSM costs provided by ENSC, and included as Table 1 below for ease of reference.

Table 1: Costs by Program, 2013 – 2015 (\$ thousands) revised 04/18/12

Program Type	2013	2014	2015
<u>Residential Programs</u>			
Efficient Products	\$3,997	\$4,189	\$5,014
Existing Homes	\$8,718	\$10,351	\$11,543
Home Energy Report	\$1,017	\$1,017	\$1,017
New Construction	\$5,470	\$6,551	\$7,950
<u>Commercial and Industrial Programs</u>			
Prescriptive	\$8,116	\$7,982	\$7,564
Custom	\$9,471	\$9,094	\$9,185
Small Business	\$4,625	\$3,524	\$2,933
<u>Enabling Strategies</u>			
Education and Outreach	\$2,500	\$2,700	\$2,900
Development and Research	\$1,350	\$1,350	\$1,400
Other Enabling Strategies	\$980	\$990	\$860
Total	\$46,246	\$47,748	\$50,366

The DSM costs for future years include all overhead costs based on a proportional mark-up over direct program costs. To calculate the preliminary allocation of Enabling

Strategies, all customer classes are assumed to benefit in proportion to ENSC's total direct costs of the other DSM programs.³ This is a change from previous years in which customer count was used to allocate Enabling Strategies costs.

5.2 PRELIMINARY DSM RATE AND BILL IMPACTS

Attachment 2 shows the potential impact on the annual DSM rate rider of the 2013-2015 DSM Plan by customer class. Since the 2012 DSM rate includes a true-up (balance adjustment) for 2010, the DSM rate impacts are shown both with and without the balance adjustment included in the 2012 DSM rate.

Attachment 3 presents the impact on electricity bills by customer rate classes of the 2013-2015 DSM Plan.

The bill and rate impacts should be viewed as indicative only. Actual impacts will vary for a number of reasons, including the following.

- When the CAM is used to allocate the ENSC's actual costs as per its audited financial statements, the results can be expected to differ from the preliminary budget which projects program costs using a standard mark-up for overhead costs rather than the more detailed and precise CAM.
- Actual program costs may vary from the preliminary budget as ENSC identifies opportunities. If expenditures are reallocated between programs that benefit different customer classes, the rate and bill impacts by class may change although the total ENSC EDSM budget does not change.
- NSPI rates and load forecasts can be expected to change in future years which will change the calculation of rate and bill impacts.

³ Sufficiently detailed information on the customer classes that will benefit from the Enabling Strategies is not presently available to allocate costs directly to customer classes. However, direct allocations are expected to be practical and appropriate for many of the actual 2013-2015 Enabling Strategy costs and the true-up process.

6 SUMMARY OF RECOMMENDATIONS AND CONCLUSION

Elenchus has developed a cost allocation model that consists of two parts:

- Part One allocates all cost to programs so that the total costs of ratepayer-funded and taxpayer-funded can be determined; and
- Part Two allocates the ratepayer-funded program costs to NSPI classes.

Part One of the CAM relies on the methodology that was approved by the UARB in its December 19, 2011 Order. This part of the model is being used to prepare ENSC's audited financial statements for 2011. The same model will be used for allocating costs to ratepayers and taxpayers for ENSC's audited financial statements in future years.

Part Two of the model will be used commencing with the 2013 program year to determine the appropriate DSM costs to recover from each customer class. The final true-up adjustments for the DSM rate riders will be established to recover the allocated costs based on ENSC's actual expenditures. This part of the model is consistent with the DSM Cost Allocation Approach that is in place for the years 2010, 2011 and 2012 as set out in the 2009 Settlement Agreement with one exception, as noted below.

Elenchus reviewed the current Cost Allocation Approach as requested by ENSC. As a result of this review, Elenchus recommends the following.

Recommendation #1: EDSM costs should continue to be allocated to NSPI rate classes for purposes of determining the preliminary and final rate riders with:

- 25% of costs being allocated on the basis of system benefits, and
- 75% of costs being allocated on the basis of participating class benefits.

Recommendation #2: Enabling Strategies costs should be allocated using the same System/Participant Benefit approach that is used for other programs where feasible. Hence, 75% of costs would be allocated on the basis of the customer classes that are expected to benefit from an Enabling Strategy where those participants can be reasonably identified. For

Enabling Strategies where it is not practical to identify the participating (or benefiting) customer classes, the Participant Benefit costs (75% of the costs of the Enabling Strategy) should be allocated on the basis of the proportional allocation of all other program costs to the customer classes.

The methodological change contained in Recommendation #2 would come into effect starting with the 2013 Plan Year.

Attachment 1:

Derivation of Allocated Costs

<u>Table</u>	<u>Page</u>
TABLE 1 (2013) Allocation of program costs associated with system benefits	Attachment 1-1
TABLE 2 (2013) Allocation of Program Costs associated with participating classes	Attachment 1-2
TABLE 2 a) (2013) DSM Program participation before accounting for Municipal Class	Attachment 1-3
TABLE 2 b) (2013) DSM Program participation after accounting for Municipal Class	Attachment 1-4
TABLE 3 (2013) Preliminary Allocation of Program Costs among rate classes	Attachment 1-5
TABLE 1 (2014) Allocation of program costs associated with system benefits	Attachment 1-6
TABLE 2 (2014) Allocation of Program Costs associated with participating classes	Attachment 1-7
TABLE 2 a) (2014) DSM Program participation before accounting for Municipal Class	Attachment 1-8
TABLE 2 b) (2014) DSM Program participation after accounting for Municipal Class	Attachment 1-9
TABLE 3 (2014) Preliminary Allocation of Program Costs among rate classes	Attachment 1-10
TABLE 1 (2015) Allocation of program costs associated with system benefits	Attachment 1-11
TABLE 2 (2015) Allocation of Program Costs associated with participating classes	Attachment 1-12
TABLE 2 a) (2015) DSM Program participation before accounting for Municipal Class	Attachment 1-13
TABLE 2 b) (2015) DSM Program participation after accounting for Municipal Class	Attachment 1-14
TABLE 3 (2015) Preliminary Allocation of Program Costs among rate classes	Attachment 1-15

Attachment 2:
Preliminary DSM Rate Impacts

<u>Table</u>	<u>Page</u>
Table 2.1 Derivation of Prospective Rates	Attachment 2-1
Table 2.2 DSM Rate Rider Impacts using 2012 DSM Rate Rider with Balance Adjustment	Attachment 2-2
Table 2.3 DSM Rate Rider Impacts using 2012 DSM Rate Rider without Balance Adjustment	Attachment 2-3

Attachment 3:
Bill Impacts by Rate Class

<u>Table</u>	<u>Page</u>
Table 3.1 Residential (Domestic)	Attachment 3-1
Table 3.2 Residential (Domestic, winter time-of-day)	Attachment 3-2
Table 3.3 Residential (Domestic, non-winter time-of-day)	Attachment 3-3
Table 3.4 Small General	Attachment 3-4
Table 3.5 General Demand	Attachment 3-5
Table 3.6 Large General	Attachment 3-6
Table 3.7 Small Industrial	Attachment 3-7
Table 3.8 Medium Industrial	Attachment 3-8
Table 3.9 Large Industrial	Attachment 3-9
Table 3.10 ELI 2P-RTP	Attachment 3-10
Table 3.11 Municipal	Attachment 3-11
Table 3.12 Unmetered	Attachment 3-12
Table 3.13 Bowater Mersey (AE only)	Attachment 3-13
Table 3.14 Gen. Repl. / Load Following	Attachment 3-14

Line #

TABLE 1 (2013) Allocation of 25% of program costs associated with system benefits

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COLUMN

A

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C

D

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G

H

Program Cost Recovery by Benefits

System Benefits25%\$ 11,561,515

Combined Class and Participant Benefits75%\$ 34,684,545

Total100%\$ 46,246,060

Functionalization of system Benefit DSM Costs

Factors

Generation100%

Transmission0%

Distribution0%

Retail0%

Classification of System Benefit DSM Costs

Factors¹

Demand-related33.49%

Energy-related66.51%

Total100%

Demand Related Costs

Energy Related Costs

Total

Rate Class

3 CP kW Demands²

Demand-related

\$ Amount

MWh Energy Requirement³

Energy-related

\$ Amount

Relative Share

Total Amount

Residential3,341,20257.5%\$ 2,225,8424,372,50044.5%\$ 3,420,68748.8%\$ 5,646,529

Small General150,2672.6%\$ 100,105219,5002.2%\$ 171,7192.4%\$ 271,824

General Demand1,289,09222.2%\$ 858,7672,534,00025.8%\$ 1,982,39524.6%\$ 2,841,162

Large General155,0142.7%\$ 103,267394,4004.0%\$ 308,5463.6%\$ 411,814

Small Industrial102,6311.8%\$ 68,371261,9002.7%\$ 204,8892.4%\$ 273,260

Medium Industrial202,0713.5%\$ 134,615512,9005.2%\$ 401,2514.6%\$ 535,867

Large Industrial324,3255.6%\$ 216,059932,6009.5%\$ 729,5908.2%\$ 945,649

ELI 2P-RTP-0.0%\$ -0.0%\$ -0.0%\$ -

Municipal122,0942.1%\$ 81,337197,4002.0%\$ 154,4302.0%\$ 235,766

Unmetered67,4881.2%\$ 44,959115,7001.2%\$ 90,5141.2%\$ 135,473

Bowater Mersey (AE only)⁴42,2300.7%\$ 28,133179,9001.8%\$ 140,7391.5%\$ 168,872

Gen. Repl. / Load Foll.15,7560.3%\$ 10,496108,4001.1%\$ 84,8030.8%\$ 95,299

Wholesale Market Backup / Top-up-0.0%\$ -0.0%\$ -0.0%\$ -

1P-RTP-0.0%\$ -0.0%\$ -0.0%\$ -

Total5,812,170100.0%\$ 3,871,9519,829,200100.0%\$ 7,689,564100.0%\$ 11,561,515

Classification Breakdown33.5%66.5%100.0%

¹ The classification is the weighted average of the fully classified total generation plant portion of rate base as shown in the "Base Cost of Fuel Cost of Service Allocation of Fuel Expenses among Rate Classes" table in line #32 under Purchased Power Regular / Fixed section in Appendix C of the 2011 Base Cost of Fuel Compliance Filing submission.

² Initially sourced from Base Cost of Fuel of Service Allocation of Fuel Expenses among Rate Classes" table under Cost Allocation Factors in Appendix C of the 2011 Base Cost of Fuel Compliance Filing submission, subsequently scaled in proportion to the change in MWh from that submission to the Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

³ Source: Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

⁴ Source: Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

⁵ All residential rate classes use the same unit fixed cost estimate

Attachment 1-1

E-ENSC-R-12

Date Revised: April 18, 2012

TABLE 2 (2013) Preliminary Allocation of 75% of DSM Program Costs associated with benefits realized by participating classes

COLUMN FORMULA	A	B	C	D	E	F	G	H	I	J	K	L
	Σ col A to J											K * 75%
	Program costs incurred on participating rate classes											Directly Assigned to Participating rate classes (75% of the total)
Program	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies	All Program Costs Combined	
Rate Class												
Residential	\$ 8,550,215	\$ 5,364,453	\$ 3,075,086	\$ 997,795	\$ 703,037	\$ 74,422	\$ 696,273	\$ 1,530,830	\$ 687,408	\$ 706,851	\$ 22,386,371	\$ 16,789,778
Small General	\$ -	\$ -	\$ 420,383	\$ -	\$ 700,322	\$ 55,787	\$ 721,774	\$ 82,616	\$ 57,108	\$ 22,804	\$ 2,060,794	\$ 1,545,595
General Demand	\$ -	\$ -	\$ 366,141	\$ -	\$ 4,584,422	\$ 6,764,270	\$ 2,704,490	\$ 627,553	\$ 433,794	\$ 173,223	\$ 15,653,893	\$ 11,740,419
Large General	\$ -	\$ -	\$ 28,856	\$ -	\$ 23,441	\$ 620,262	\$ -	\$ 29,271	\$ 20,233	\$ 8,080	\$ 730,143	\$ 547,607
Small Industrial	\$ -	\$ -	\$ 19,031	\$ -	\$ 400,790	\$ 24,314	\$ 376,142	\$ 35,700	\$ 24,677	\$ 9,854	\$ 890,508	\$ 667,881
Medium Industrial	\$ -	\$ -	\$ 1,301	\$ -	\$ 70,197	\$ 720,598	\$ -	\$ 34,473	\$ 23,830	\$ 9,516	\$ 859,914	\$ 644,936
Large Industrial	\$ -	\$ -	\$ -	\$ -	\$ 132,765	\$ 406,067	\$ -	\$ 23,451	\$ 16,210	\$ 6,473	\$ 584,967	\$ 438,725
ELI 2P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Municipal	\$ 168,176	\$ 105,515	\$ 86,639	\$ 19,626	\$ 187,885	\$ 249,035	\$ 126,478	\$ 54,717	\$ 30,480	\$ 20,734	\$ 1,049,283	\$ 786,962
Unmetered	\$ -	\$ -	\$ -	\$ -	\$ 1,313,549	\$ 556,524	\$ -	\$ 81,389	\$ 56,260	\$ 22,466	\$ 2,030,188	\$ 1,522,641
Bowater Mersey (AE only)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Gen. Repl. / Load Foll.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Wholesale Market Backup / Top-up	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 8,718,391	\$ 5,469,968	\$ 3,997,437	\$ 1,017,420	\$ 8,116,407	\$ 9,471,279	\$ 4,625,157	\$ 2,500,000	\$ 1,350,000	\$ 980,000	\$ 46,246,060	\$ 34,684,545

Attachment 1-2

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 a) (2013) Estimate of DSM Program participation by rate classes before accounting for the Municipal Class

COLUMN		A	B	C	D	E	F	G	H	I	J
		Relative shares of program costs incurred on participating rate classes before Municipal Class									
Program	Rate Class	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
	Residential	100.0%	100.0%	78.6%	100.0%	8.9%	0.8%	15.5%	61.2%	50.9%	72.1%
	Small General	0.0%	0.0%	10.7%	0.0%	8.8%	0.6%	16.0%	3.5%	4.4%	2.5%
	General Demand	0.0%	0.0%	9.4%	0.0%	57.8%	73.3%	60.1%	26.6%	33.7%	19.1%
	Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.7%	0.0%	1.2%	1.6%	0.9%
	Small Industrial	0.0%	0.0%	0.5%	0.0%	5.1%	0.3%	8.4%	1.5%	1.9%	1.1%
	Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.8%	0.0%	1.5%	1.9%	1.1%
	Large Industrial	0.0%	0.0%	0.0%	0.0%	1.7%	4.4%	0.0%	1.0%	1.3%	0.7%
	ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Municipal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unmetered	0.0%	0.0%	0.0%	0.0%	16.6%	6.0%	0.0%	3.5%	4.4%	2.5%
	Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Attachment 1-3

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 b) (2013) Preliminary Estimate of DSM Program participation by rate class after accounting for the Municipal Class

COLUMN	A	B	C	D	E	F	G	H	I	J
	Program costs incurred on participating rate classes									
Program	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
Rate Class										
Residential	98.1%	98.1%	76.9%	98.1%	8.7%	0.8%	15.1%	61.2%	50.9%	72.1%
Small General	0.0%	0.0%	10.5%	0.0%	8.6%	0.6%	15.6%	3.3%	4.2%	2.3%
General Demand	0.0%	0.0%	9.2%	0.0%	56.5%	71.4%	58.5%	25.1%	32.1%	17.7%
Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.5%	0.0%	1.2%	1.5%	0.8%
Small Industrial	0.0%	0.0%	0.5%	0.0%	4.9%	0.3%	8.1%	1.4%	1.8%	1.0%
Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.6%	0.0%	1.4%	1.8%	1.0%
Large Industrial	0.0%	0.0%	0.0%	0.0%	1.6%	4.3%	0.0%	0.9%	1.2%	0.7%
ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Municipal	1.9%	1.9%	2.2%	1.9%	2.3%	2.6%	2.7%	2.2%	2.3%	2.1%
Unmetered	0.0%	0.0%	0.0%	0.0%	16.2%	5.9%	0.0%	3.3%	4.2%	2.3%
Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1P-RTP	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Relative Shares of Municipal sales in total NSPI sales by sector				
DSM-eligible sales by sector	NSPI	Breakdown of Municipal Class Sales by Sector ¹		
		% of Mun	% of NSPI	
Residential	4,297,308,762	82,894,296	42.0%	1.929%
General	3,160,475,830	97,894,217	49.6%	3.097%
Industrial	<u>1,801,729,475</u>	<u>16,578,859</u>	8.4%	<u>0.920%</u>
	9,259,514,067	197,367,372	100.0%	2.132%

¹ Source: Municipal electric utility sales and purchase forecasts for 2012 provided by MEUNSC**Attachment 1-4**

E-ENSC-R-12

Date Revised: April 18, 2012

TABLE 3 (2013) Preliminary Allocation of Program Costs among rate classes

COLUMN	A	B	C	D	E	F	G	H
FORMULA	Table 2 Column K		Table 1 Column H		Table 2 Column L		C + E	
	Total Expenditure by Rate Class		System Benefit Costs (25% of the total expenditure allocated to classes using COS methodology)		Participating Class benefit Costs (75% of the total expenditure directly assigned to participating classes)		Total Allocated Costs	
	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share
Rate Class								
Residential	\$ 22,386,371	48.4%	\$ 5,646,529	48.8%	\$ 16,789,778	48.4%	\$ 22,436,308	48.5%
Small General	\$ 2,060,794	4.5%	\$ 271,824	2.4%	\$ 1,545,595	4.5%	\$ 1,817,419	3.9%
General Demand	\$ 15,653,893	33.8%	\$ 2,841,162	24.6%	\$ 11,740,419	33.8%	\$ 14,581,581	31.5%
Large General	\$ 730,143	1.6%	\$ 411,814	3.6%	\$ 547,607	1.6%	\$ 959,421	2.1%
Small Industrial	\$ 890,508	1.9%	\$ 273,260	2.4%	\$ 667,881	1.9%	\$ 941,141	2.0%
Medium Industrial	\$ 859,914	1.9%	\$ 535,867	4.6%	\$ 644,936	1.9%	\$ 1,180,802	2.6%
Large Industrial	\$ 584,967	1.3%	\$ 945,649	8.2%	\$ 438,725	1.3%	\$ 1,384,374	3.0%
ELI 2P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Municipal	\$ 1,049,283	2.3%	\$ 235,766	2.0%	\$ 786,962	2.3%	\$ 1,022,728	2.2%
Unmetered	\$ 2,030,188	4.4%	\$ 135,473	1.2%	\$ 1,522,641	4.4%	\$ 1,658,114	3.6%
Bowater Mersey (AE only)	\$ -	0.0%	\$ 168,872	1.5%	\$ -	0.0%	\$ 168,872	0.4%
Gen. Repl. / Load Foll.	\$ -	0.0%	\$ 95,299	0.8%	\$ -	0.0%	\$ 95,299	0.2%
Wholesale Market Backup / Top-up	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
1P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Total	\$ 46,246,060	100.0%	\$ 11,561,515	100.0%	\$ 34,684,545	100.0%	\$ 46,246,060	100.0%

Attachment 1-5

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 1 (2014) Allocation of 25% of program costs associated with system benefit

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COLUMN

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Program Cost Recovery by Benefits

System Benefits	25%	\$ 11,936,968
Combined Class and Participant Benefits	75%	\$ 35,810,904
Total	100%	\$ 47,747,872

Functionalization of system Benefit DSM

Factors		
Generation		100%
Transmission		0%
Distribution		0%
Retail		0%

Classification of System Benefit DSM

Factors ¹	
Demand-related	33.49%
Energy-related	66.51%
Total	100%

Demand Related Costs

Energy Related Costs

Total

Rate Class	Demand Related Costs			Energy Related Costs			Total	
	3 CP kW Demands ²	Demand-related	\$ Amount	MWh Energy Requirement ³	Energy-related	\$ Amount	Relative Share	Total Amount
Residential	3,341,202	57.5%	\$ 2,298,125	4,372,500	44.5%	\$ 3,531,772	48.8%	\$ 5,829,897
Small General	150,267	2.6%	\$ 103,356	219,500	2.2%	\$ 177,295	2.4%	\$ 280,651
General Demand	1,289,092	22.2%	\$ 886,655	2,534,000	25.8%	\$ 2,046,772	24.6%	\$ 2,933,427
Large General	155,014	2.7%	\$ 106,621	394,400	4.0%	\$ 318,566	3.6%	\$ 425,187
Small Industrial	102,631	1.8%	\$ 70,591	261,900	2.7%	\$ 211,543	2.4%	\$ 282,134
Medium Industrial	202,071	3.5%	\$ 138,987	512,900	5.2%	\$ 414,281	4.6%	\$ 553,269
Large Industrial	324,325	5.6%	\$ 223,075	932,600	9.5%	\$ 753,283	8.2%	\$ 976,358
ELI 2P-RTP	-	0.0%	\$ -	-	0.0%	\$ -	0.0%	\$ -
Municipal	122,094	2.1%	\$ 83,978	197,400	2.0%	\$ 159,445	2.0%	\$ 243,423
Unmetered	67,488	1.2%	\$ 46,419	115,700	1.2%	\$ 93,454	1.2%	\$ 139,873
Bowater Mersey (AE only) ⁴	42,230	0.7%	\$ 29,047	179,900	1.8%	\$ 145,309	1.5%	\$ 174,356
Gen. Repl. / Load Foll.	15,756	0.3%	\$ 10,837	108,400	1.1%	\$ 87,557	0.8%	\$ 98,394
Wholesale Market Backup / Top-up	-	0.0%	\$ -	-	0.0%	\$ -	0.0%	\$ -
1P-RTP	-	0.0%	\$ -	-	0.0%	\$ -	0.0%	\$ -
Total	5,812,170	100.0%	\$ 3,997,691	9,829,200	100.0%	\$ 7,939,277	100.0%	\$ 11,936,968
Classification Breakdown		33.5%			66.5%		100.0%	

¹ The classification is the weighted average of the fully classified total generation plant portion of rate base as shown in the "Base Cost of Fuel Cost of Service Allocation of Fuel Expenses among Rate Classes" table in line #32 under Purchased Power Regular / Fixed section in Appendix C of the 2011 Base Cost of Fuel Compliance Filing submission.

² Initially sourced from Base Cost of Fuel of Service Allocation of Fuel Expenses among Rate Classes" table under Cost Allocation Factors in Appendix C of the 2011 Base Cost of Fuel Compliance Filing submission, subsequently scaled in proportion to the change in MWh from that submission to the Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

³ Source: Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

⁴ Source: Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

⁵ All residential rate classes use the same unit fixed cost estimate

Attachment 1-6

E-ENSC-R-12

Date Revised: April 18, 2012

TABLE 2 (2014) Preliminary Allocation of 75% of DSM Program Costs associated with benefits realized by participating classes.

COLUMN FORMULA	A	B	C	D	E	F	G	H	I	J	K	L
	Σ col A to J											K * 75%
Program	Program costs incurred on participating rate classes											Program Costs Directly Assigned to Participating rate classes (75%)
	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies	All Program Costs Combined	
Rate Class												
Residential	\$ 10,151,068	\$ 6,424,393	\$ 3,222,459	\$ 997,795	\$ 691,356	\$ 71,458	\$ 530,568	\$ 1,697,208	\$ 692,697	\$ 699,188	\$ 25,178,187	\$ 18,883,640
Small General	\$ -	\$ -	\$ 440,530	\$ -	\$ 688,686	\$ 53,565	\$ 550,000	\$ 83,202	\$ 55,250	\$ 23,777	\$ 1,895,009	\$ 1,421,257
General Demand	\$ -	\$ -	\$ 383,688	\$ -	\$ 4,508,248	\$ 6,494,811	\$ 2,060,852	\$ 645,707	\$ 428,782	\$ 184,526	\$ 14,706,614	\$ 11,029,960
Large General	\$ -	\$ -	\$ 30,239	\$ -	\$ 23,051	\$ 595,554	\$ -	\$ 31,155	\$ 20,689	\$ 8,903	\$ 709,591	\$ 532,193
Small Industrial	\$ -	\$ -	\$ 19,943	\$ -	\$ 394,130	\$ 23,345	\$ 286,625	\$ 34,766	\$ 23,086	\$ 9,935	\$ 791,831	\$ 593,873
Medium Industrial	\$ -	\$ -	\$ 1,364	\$ -	\$ 69,030	\$ 691,892	\$ -	\$ 36,602	\$ 24,306	\$ 10,460	\$ 833,654	\$ 625,241
Large Industrial	\$ -	\$ -	\$ -	\$ -	\$ 130,559	\$ 389,891	\$ -	\$ 24,990	\$ 16,595	\$ 7,142	\$ 569,177	\$ 426,883
ELI 2P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Municipal	\$ 199,664	\$ 126,363	\$ 90,791	\$ 19,626	\$ 184,763	\$ 239,114	\$ 96,377	\$ 58,687	\$ 30,370	\$ 21,012	\$ 1,066,767	\$ 800,075
Unmetered	\$ -	\$ -	\$ -	\$ -	\$ 1,291,723	\$ 534,355	\$ -	\$ 87,682	\$ 58,225	\$ 25,057	\$ 1,997,043	\$ 1,497,782
Bowater Mersey (AE only)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Gen. Repl. / Load Foll.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Wholesale Market Backup / Top-up	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 10,350,731	\$ 6,550,755	\$ 4,189,013	\$ 1,017,420	\$ 7,981,546	\$ 9,093,984	\$ 3,524,422	\$ 2,700,000	\$ 1,350,000	\$ 990,000	\$ 47,747,872	\$ 35,810,904

Attachment 1-7

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 a) (2014) Estimate of DSM Program participation by rate classes before accounting for the Municipal Class

COLUMN	A	B	C	D	E	F	G	H	I	J
	Relative shares of program costs incurred on participating rate classes before Municipal Class									
Program Rate Class	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
Residential	100.0%	100.0%	78.6%	100.0%	8.9%	0.8%	15.5%	62.9%	51.3%	70.6%
Small General	0.0%	0.0%	10.7%	0.0%	8.8%	0.6%	16.0%	3.3%	4.3%	2.6%
General Demand	0.0%	0.0%	9.4%	0.0%	57.8%	73.3%	60.1%	25.4%	33.3%	20.1%
Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.7%	0.0%	1.2%	1.6%	1.0%
Small Industrial	0.0%	0.0%	0.5%	0.0%	5.1%	0.3%	8.4%	1.4%	1.8%	1.1%
Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.8%	0.0%	1.4%	1.9%	1.1%
Large Industrial	0.0%	0.0%	0.0%	0.0%	1.7%	4.4%	0.0%	1.0%	1.3%	0.8%
ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Municipal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unmetered	0.0%	0.0%	0.0%	0.0%	16.6%	6.0%	0.0%	3.4%	4.5%	2.7%
Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Attachment 1-8

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 b) (2014) Preliminary Estimate of DSM Program participation by rate class after accounting for the Municipal Class

COLUMN	A	B	C	D	K	L	M	R	S	T
	Program costs incurred on participating rate classes									
Program	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
Rate Class										
Residential	98.1%	98.1%	76.9%	98.1%	8.7%	0.8%	15.1%	62.9%	51.3%	70.6%
Small General	0.0%	0.0%	10.5%	0.0%	8.6%	0.6%	15.6%	3.1%	4.1%	2.4%
General Demand	0.0%	0.0%	9.2%	0.0%	56.5%	71.4%	58.5%	23.9%	31.8%	18.6%
Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.5%	0.0%	1.2%	1.5%	0.9%
Small Industrial	0.0%	0.0%	0.5%	0.0%	4.9%	0.3%	8.1%	1.3%	1.7%	1.0%
Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.6%	0.0%	1.4%	1.8%	1.1%
Large Industrial	0.0%	0.0%	0.0%	0.0%	1.6%	4.3%	0.0%	0.9%	1.2%	0.7%
ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Municipal	1.9%	1.9%	2.2%	1.9%	2.3%	2.6%	2.7%	2.2%	2.2%	2.1%
Unmetered	0.0%	0.0%	0.0%	0.0%	16.2%	5.9%	0.0%	3.2%	4.3%	2.5%
Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1P-RTP	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Relative Shares of Municipal sales in total NSPI sales by sector				
DSM-eligible sales by sector	NSPI	Breakdown of Municipal Class Sales by Sector ¹		
		% of Mun	% of NSPI	
Residential	4,297,308,762	82,894,296	42.0%	1.929%
General	3,160,475,830	97,894,217	49.6%	3.097%
Industrial	1,801,729,475	16,578,859	8.4%	0.920%
	9,259,514,067	197,367,372	100.0%	2.132%

¹ Source: Municipal electric utility sales and purchase forecasts for 2012 provided by MEUNSC

Attachment 1-9

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 3 (2014) Preliminary Allocation of Program Costs among rate classes

COLUMN	A	B	C	D	E	F	G	H
FORMULA	Table 2 Column K		Table 1 Column H		Table 2 Column L		C + E	
	Total Expenditure by Rate Class		System Benefit Costs (25% of the total expenditure allocated to classes using COS methodology)		Participating Class benefit Costs (75% of the total expenditure directly assigned to participating classes)		Total Allocated Costs	
	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share
Rate Class								
Residential	\$ 25,178,187	52.7%	\$ 5,829,897	48.8%	\$ 18,883,640	52.7%	\$ 24,713,537	51.8%
Small General	\$ 1,895,009	4.0%	\$ 280,651	2.4%	\$ 1,421,257	4.0%	\$ 1,701,908	3.6%
General Demand	\$ 14,706,614	30.8%	\$ 2,933,427	24.6%	\$ 11,029,960	30.8%	\$ 13,963,387	29.2%
Large General	\$ 709,591	1.5%	\$ 425,187	3.6%	\$ 532,193	1.5%	\$ 957,380	2.0%
Small Industrial	\$ 791,831	1.7%	\$ 282,134	2.4%	\$ 593,873	1.7%	\$ 876,007	1.8%
Medium Industrial	\$ 833,654	1.7%	\$ 553,269	4.6%	\$ 625,241	1.7%	\$ 1,178,509	2.5%
Large Industrial	\$ 569,177	1.2%	\$ 976,358	8.2%	\$ 426,883	1.2%	\$ 1,403,241	2.9%
ELI 2P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Municipal	\$ 1,066,767	2.2%	\$ 243,423	2.0%	\$ 800,075	2.2%	\$ 1,043,498	2.2%
Unmetered	\$ 1,997,043	4.2%	\$ 139,873	1.2%	\$ 1,497,782	4.2%	\$ 1,637,655	3.4%
Bowater Mersey (AE only)	\$ -	0.0%	\$ 174,356	1.5%	\$ -	0.0%	\$ 174,356	0.4%
Gen. Repl. / Load Foll.	\$ -	0.0%	\$ 98,394	0.8%	\$ -	0.0%	\$ 98,394	0.2%
Wholesale Market Backup / Top-up	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
1P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Total	\$ 47,747,872	100.0%	\$ 11,936,968	100.0%	\$ 35,810,904	100.0%	\$ 47,747,872	100.0%

Attachment 1-10

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 1 (2015) Allocation of 25% of program costs associated with system benefits

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COLUMN	A	B	C	D	E	F	G	H																											
Program Cost Recovery by Benefits <table><tr><td>System Benefits</td><td>25%</td><td>\$ 12,591,593</td></tr><tr><td>Combined Class and Participant Benefits</td><td>75%</td><td>\$ 37,774,780</td></tr><tr><td>Total</td><td>100%</td><td>\$ 50,366,374</td></tr></table> Functionalization of system Benefit DSM <table><tr><th colspan="2">Factors</th></tr><tr><td>Generation</td><td>100%</td></tr><tr><td>Transmission</td><td>0%</td></tr><tr><td>Distribution</td><td>0%</td></tr><tr><td>Retail</td><td>0%</td></tr></table> Classification of System Benefit DSM <table><tr><th colspan="2">Factors¹</th></tr><tr><td>Demand-related</td><td>33.49%</td></tr><tr><td>Energy-related</td><td>66.51%</td></tr><tr><td>Total</td><td>100%</td></tr></table>									System Benefits	25%	\$ 12,591,593	Combined Class and Participant Benefits	75%	\$ 37,774,780	Total	100%	\$ 50,366,374	Factors		Generation	100%	Transmission	0%	Distribution	0%	Retail	0%	Factors ¹		Demand-related	33.49%	Energy-related	66.51%	Total	100%
System Benefits	25%	\$ 12,591,593																																	
Combined Class and Participant Benefits	75%	\$ 37,774,780																																	
Total	100%	\$ 50,366,374																																	
Factors																																			
Generation	100%																																		
Transmission	0%																																		
Distribution	0%																																		
Retail	0%																																		
Factors ¹																																			
Demand-related	33.49%																																		
Energy-related	66.51%																																		
Total	100%																																		

Attachment 1-11

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 (2015) Preliminary Allocation of 75% of DSM Program Costs associated with benefits realized by participating classes.

COLUMN FORMULA	A	B	C	D	E	F	G	H	I	J	K	L
	Σ col A to J											K * 75%
Program	Program costs incurred on participating rate classes											Program Costs Directly Assigned to Participating rate classes (75%)
	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies	All Program Costs Combined	
Rate Class												
Residential	\$ 11,320,809	\$ 7,796,450	\$ 3,856,765	\$ 997,795	\$ 655,172	\$ 72,172	\$ 441,591	\$ 1,719,358	\$ 715,854	\$ 601,113	\$ 28,177,079	\$ 21,132,809
Small General	\$ -	\$ -	\$ 527,243	\$ -	\$ 652,642	\$ 54,100	\$ 457,764	\$ 99,112	\$ 57,913	\$ 21,349	\$ 1,870,124	\$ 1,402,593
General Demand	\$ -	\$ -	\$ 459,213	\$ -	\$ 4,272,298	\$ 6,559,751	\$ 1,715,244	\$ 761,997	\$ 445,245	\$ 164,139	\$ 14,377,887	\$ 10,783,415
Large General	\$ -	\$ -	\$ 36,191	\$ -	\$ 21,845	\$ 601,509	\$ -	\$ 38,640	\$ 22,578	\$ 8,323	\$ 729,085	\$ 546,814
Small Industrial	\$ -	\$ -	\$ 23,869	\$ -	\$ 373,502	\$ 23,579	\$ 238,557	\$ 38,638	\$ 22,577	\$ 8,323	\$ 729,044	\$ 546,783
Medium Industrial	\$ -	\$ -	\$ 1,632	\$ -	\$ 65,417	\$ 698,810	\$ -	\$ 44,868	\$ 26,217	\$ 9,665	\$ 846,610	\$ 634,958
Large Industrial	\$ -	\$ -	\$ -	\$ -	\$ 123,726	\$ 393,790	\$ -	\$ 30,319	\$ 17,716	\$ 6,531	\$ 572,081	\$ 429,061
ELI 2P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Municipal	\$ 222,672	\$ 153,350	\$ 108,662	\$ 19,626	\$ 175,093	\$ 241,505	\$ 80,215	\$ 63,733	\$ 31,521	\$ 18,298	\$ 1,114,674	\$ 836,006
Unmetered	\$ -	\$ -	\$ -	\$ -	\$ 1,224,118	\$ 539,698	\$ -	\$ 103,335	\$ 60,380	\$ 22,259	\$ 1,949,789	\$ 1,462,342
Bowater Mersey (AE only)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Gen. Repl. / Load Foll.	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Wholesale Market Backup / Top-up	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1P-RTP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 11,543,481	\$ 7,949,800	\$ 5,013,575	\$ 1,017,420	\$ 7,563,812	\$ 9,184,914	\$ 2,933,371	\$ 2,900,000	\$ 1,400,000	\$ 860,000	\$ 50,366,374	\$ 37,774,780

Attachment 1-12

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 a) (2015) Estimate of DSM Program participation by rate classes before accounting for the Municipal Class

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COLUMN		A	B	C	D	E	F	G	H	I	J
		Relative shares of program costs incurred on participating rate classes before Municipal Class									
Program	Rate Class	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
	Residential	100.0%	100.0%	78.6%	100.0%	8.9%	0.8%	15.5%	59.3%	51.1%	69.9%
	Small General	0.0%	0.0%	10.7%	0.0%	8.8%	0.6%	16.0%	3.6%	4.3%	2.7%
	General Demand	0.0%	0.0%	9.4%	0.0%	57.8%	73.3%	60.1%	27.8%	33.3%	20.5%
	Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.7%	0.0%	1.4%	1.7%	1.0%
	Small Industrial	0.0%	0.0%	0.5%	0.0%	5.1%	0.3%	8.4%	1.4%	1.7%	1.0%
	Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.8%	0.0%	1.6%	2.0%	1.2%
	Large Industrial	0.0%	0.0%	0.0%	0.0%	1.7%	4.4%	0.0%	1.1%	1.3%	0.8%
	ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Municipal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unmetered	0.0%	0.0%	0.0%	0.0%	16.6%	6.0%	0.0%	3.8%	4.5%	2.8%
	Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	1P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Attachment 1-13

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 2 b) (2015) Preliminary Estimate of DSM Program participation by rate class after accounting for the Municipal Class

COLUMN	A	B	C	D	E	F	G	M	N	O
	Program costs incurred on participating rate classes									
Program	Existing Homes	New Construction	Efficient Products	Home Energy Report	Prescriptive	Custom	Small Business	Education & Outreach	Development and Research	Other Enabling Strategies
Rate Class										
Residential	98.1%	98.1%	76.9%	98.1%	8.7%	0.8%	15.1%	59.3%	51.1%	69.9%
Small General	0.0%	0.0%	10.5%	0.0%	8.6%	0.6%	15.6%	3.4%	4.1%	2.5%
General Demand	0.0%	0.0%	9.2%	0.0%	56.5%	71.4%	58.5%	26.3%	31.8%	19.1%
Large General	0.0%	0.0%	0.7%	0.0%	0.3%	6.5%	0.0%	1.3%	1.6%	1.0%
Small Industrial	0.0%	0.0%	0.5%	0.0%	4.9%	0.3%	8.1%	1.3%	1.6%	1.0%
Medium Industrial	0.0%	0.0%	0.0%	0.0%	0.9%	7.6%	0.0%	1.5%	1.9%	1.1%
Large Industrial	0.0%	0.0%	0.0%	0.0%	1.6%	4.3%	0.0%	1.0%	1.3%	0.8%
ELI 2P-RTP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Municipal	1.9%	1.9%	2.2%	1.9%	2.3%	2.6%	2.7%	2.2%	2.3%	2.1%
Unmetered	0.0%	0.0%	0.0%	0.0%	16.2%	5.9%	0.0%	3.6%	4.3%	2.6%
Bowater Mersey (AE only)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gen. Repl. / Load Foll.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Wholesale Market Backup / Top-up	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1P-RTP	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>	<u>0.0%</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Relative Shares of Municipal sales in total NSPI sales by sector				
DSM-eligible sales by sector	NSPI	Breakdown of Municipal Class Sales by Sector ¹		
		% of Mun	% of NSPI	
Residential	4,297,308,762	82,894,296	42.0%	1.929%
General	3,160,475,830	97,894,217	49.6%	3.097%
Industrial	<u>1,801,729,475</u>	<u>16,578,859</u>	<u>8.4%</u>	<u>0.920%</u>
	9,259,514,067	197,367,372	100.0%	2.132%

¹ Source: Municipal electric utility sales and purchase forecasts for 2012 provided by MEUNSC

Attachment 1-14

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

TABLE 3 (2015) Preliminary Allocation of Program Costs among rate classes

COLUMN	A	B	C	D	E	F	G	H
FORMULA	Table 2 Column K		Table 1 Column H		Table 2 Column L		C + E	
	Total Expenditure by Rate Class		System Benefit Costs (25% of the total expenditure allocated to classes using COS methodology)		Participating Class benefit Costs (75% of the total expenditure directly assigned to participating classes)		Total Allocated Costs	
	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share	\$ Amount	Relative Share
Rate Class								
Residential	\$ 28,177,079	55.9%	\$ 6,149,609	48.8%	\$ 21,132,809	55.9%	\$ 27,282,418	54.2%
Small General	\$ 1,870,124	3.7%	\$ 296,042	2.4%	\$ 1,402,593	3.7%	\$ 1,698,635	3.4%
General Demand	\$ 14,377,887	28.5%	\$ 3,094,296	24.6%	\$ 10,783,415	28.5%	\$ 13,877,711	27.6%
Large General	\$ 729,085	1.4%	\$ 448,504	3.6%	\$ 546,814	1.4%	\$ 995,318	2.0%
Small Industrial	\$ 729,044	1.4%	\$ 297,606	2.4%	\$ 546,783	1.4%	\$ 844,389	1.7%
Medium Industrial	\$ 846,610	1.7%	\$ 583,610	4.6%	\$ 634,958	1.7%	\$ 1,218,568	2.4%
Large Industrial	\$ 572,081	1.1%	\$ 1,029,902	8.2%	\$ 429,061	1.1%	\$ 1,458,963	2.9%
ELI 2P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Municipal	\$ 1,114,674	2.2%	\$ 256,772	2.0%	\$ 836,006	2.2%	\$ 1,092,778	2.2%
Unmetered	\$ 1,949,789	3.9%	\$ 147,543	1.2%	\$ 1,462,342	3.9%	\$ 1,609,885	3.2%
Bowater Mersey (AE only)	\$ -	0.0%	\$ 183,918	1.5%	\$ -	0.0%	\$ 183,918	0.4%
Gen. Repl. / Load Foll.	\$ -	0.0%	\$ 103,790	0.8%	\$ -	0.0%	\$ 103,790	0.2%
Wholesale Market Backup / Top-up	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
1P-RTP	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%	\$ -	0.0%
Total	\$ 50,366,374	100.0%	\$ 12,591,593	100.0%	\$ 37,774,780	100.0%	\$ 50,366,374	100.0%

Attachment 1-15

E-ENSC-R-12

Date Revised: April 18, 2012

Table 2.1 Derivation of Prospective Rates

COLUMN FORMULA	A	B	C B/A	D	E	F E/D	G	H	I H/G
Rate Class	Energy GWh ²	2013 Allocated Cost (\$millions)	Rate (cents /kWh)	Energy GWh ²	2014 Allocated Cost (\$millions)	Rate (cents /kWh)	Energy GWh ²	2015 Allocated Cost (\$millions)	Rate (cents /kWh)
Residential	4,373	22.44	0.513	4,373	24.71	0.565	4,373	27.28	0.624
Small General	220	1.82	0.828	220	1.70	0.775	220	1.70	0.774
General Demand	2,534	14.58	0.575	2,534	13.96	0.551	2,534	13.88	0.548
Large General	394	0.96	0.243	394	0.96	0.243	394	1.00	0.252
Small Industrial	262	0.94	0.359	262	0.88	0.334	262	0.84	0.322
Medium Industrial	513	1.18	0.230	513	1.18	0.230	513	1.22	0.238
Large Industrial	933	1.38	0.148	933	1.40	0.150	933	1.46	0.156
ELI 2P-RTP	-	-	-	-	-	-	-	-	-
Municipal	197	1.02	0.518	197	1.04	0.529	197	1.09	0.554
Unmetered	116	1.66	1.433	116	1.64	1.415	116	1.61	1.391
Bowater Mersey (AE only)	180	0.17	0.094	180	0.17	0.097	180	0.18	0.102
Gen. Repl. / Load Foll.	108	0.10	0.088	108	0.10	0.091	108	0.10	0.096

¹ Source: Nova Scotia Power Inc. Tarrifs & Regulations Effective January 1, 2012

² Source: Nova Scotia Power Inc. 2012 General Rate Application - Operating Revenues

Attachment 2-1

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 2.2 DSM Rate Rider Impacts using 2012 DSM Rate Rider with Balance Adjustment

COLUMN FORMULA	A	B	C B-A	D C/A	E	F E-B	G F/B	H	I H-E	J I/E	K H-A	L H/A
	2012	2013	2014		2015							
	Rate	Rate	Increase		Rate	Increase		Rate	Increase		Increase over 2012	
Rate Class	cents	cents	cents	%	cents	cents	%	cents	cents	%	cents	%
	/kWh	/kWh	/kWh		/kWh	/kWh		/kWh	/kWh		/kWh	
Residential	0.587	0.513	-0.074	-12.6%	0.565	0.052	10.1%	0.624	0.059	10.4%	0.037	6.3%
Small General	1.123	0.828	-0.295	-26.3%	0.775	-0.053	-6.4%	0.774	-0.001	-0.2%	-0.349	-31.1%
General Demand	0.457	0.575	0.118	25.9%	0.551	-0.024	-4.2%	0.548	-0.003	-0.6%	0.091	19.8%
Large General	-0.202	0.243	0.445	N/A	0.243	-0.001	-0.2%	0.252	0.010	4.0%	0.454	N/A
Small Industrial	0.506	0.359	-0.147	-29.0%	0.334	-0.025	-6.9%	0.322	-0.012	-3.6%	-0.184	-36.3%
Medium Industrial	0.448	0.230	-0.218	-48.6%	0.230	0.000	-0.2%	0.238	0.008	3.4%	-0.210	-47.0%
Large Industrial	0.185	0.148	-0.037	-19.8%	0.150	0.002	1.4%	0.156	0.006	4.0%	-0.029	-15.4%
ELI 2P-RTP	0.069	0.000	-0.069	-100.0%	0.000	0.000	0.0%	0.000	0.000	0.0%	-0.069	-100.0%
Municipal	0.490	0.518	0.028	5.7%	0.529	0.011	2.0%	0.554	0.025	4.7%	0.064	13.0%
Unmetered	-0.201	1.433	1.634	N/A	1.415	-0.018	-1.2%	1.391	-0.024	-1.7%	1.592	N/A
Bowater Mersey (AE only)	0.066	0.094	0.028	42.2%	0.097	0.003	3.2%	0.102	0.005	5.5%	0.036	54.9%
Gen. Repl. / Load Foll.	0.021	0.088	0.067	318.6%	0.091	0.003	3.2%	0.096	0.005	5.5%	0.075	355.9%

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012² Includes Rate Rider and Balance Adjustment

Attachment 2-2

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 2.3 DSM Rate Rider Impacts using 2012 DSM Rate Rider without Balance Adjustment

COLUMN FORMULA	A	B	C B-A	D C/A	E	F E-B	G F/B	H	I H-E	J I/E	K H-A	L H/A
	2012	2013			2014			2015				
	Rate ^{1,2}	Rate	Increase		Rate	Year over Year	Increase	Rate	Year over Year	Increase	Increase over 2012	
Rate Class	cents	cents	cents	%	cents	cents	%	cents	cents	%	cents	%
	/kWh	/kWh	/kWh		/kWh	/kWh		/kWh	/kWh		/kWh	
Residential	0.548	0.513	-0.035	-6.4%	0.565	0.052	10.1%	0.624	0.059	10.4%	0.076	13.9%
Small General	0.674	0.828	0.154	22.8%	0.775	-0.053	-6.4%	0.774	-0.001	-0.2%	0.100	14.8%
General Demand	0.437	0.575	0.138	31.7%	0.551	-0.024	-4.2%	0.548	-0.003	-0.6%	0.111	25.3%
Large General	0.270	0.243	-0.027	-9.9%	0.243	-0.001	-0.2%	0.252	0.010	4.0%	-0.018	-6.5%
Small Industrial	0.415	0.359	-0.056	-13.4%	0.334	-0.025	-6.9%	0.322	-0.012	-3.6%	-0.093	-22.3%
Medium Industrial	0.503	0.230	-0.273	-54.2%	0.230	0.000	-0.2%	0.238	0.008	3.4%	-0.265	-52.8%
Large Industrial	0.210	0.148	-0.062	-29.3%	0.150	0.002	1.4%	0.156	0.006	4.0%	-0.054	-25.5%
ELI 2P-RTP	0.090	0.000	-0.090	-100.0%	0.000	0.000	0.0%	0.000	0.000	0.0%	-0.090	-100.0%
Municipal	0.433	0.518	0.085	19.7%	0.529	0.011	2.0%	0.554	0.025	4.7%	0.121	27.8%
Unmetered	0.177	1.433	1.256	709.7%	1.415	-0.018	-1.2%	1.391	-0.024	-1.7%	1.214	686.1%
Bowater Mersey (AE only)	0.083	0.094	0.011	13.1%	0.097	0.003	3.2%	0.102	0.005	5.5%	0.019	23.2%
Gen. Repl. / Load Foll.	0.066	0.088	0.022	33.2%	0.091	0.003	3.2%	0.096	0.005	5.5%	0.030	45.1%

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012² Includes Rate Rider only**Attachment 2-3**

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.1: Residential (Domestic) Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹		1	\$10.83	\$10.83	1	\$10.83	\$10.83		
Demand Rate ¹									
Energy Rate 1 ¹	kWh	750	\$0.12638	\$94.79	750	\$0.12638	\$94.79		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹	kWh	750	\$0.00698	\$5.24	750	\$0.00698	\$5.24		
DSM Cost Recovery	kWh	750	\$0.00587	\$4.40	750	\$0.00513	\$3.85	(\$0.55)	(12.6%)
Sub Total				\$115.25			\$114.70	(\$0.55)	(0.5%)
HST				\$17.29			\$17.20	(\$0.08)	(0.5%)
Provincial Rebate				(\$11.53)			(\$11.47)	\$0.06	0.5%
TOTAL BILL				\$121.02			\$120.43	(\$0.58)	(0.5%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	750	\$0.00513	\$3.85	750	\$0.00565	\$4.24	\$0.39	10.1%
Sub Total				\$114.70			\$115.09	\$0.39	0.3%
HST				\$17.20			\$17.26	\$0.06	0.3%
Provincial Rebate				(\$11.47)			(\$11.51)	(\$0.04)	(0.3%)
TOTAL BILL				\$120.43			\$120.84	\$0.41	0.3%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	750	\$0.00565	\$4.24	750	\$0.00624	\$4.68	\$0.44	10.4%	\$0.28	6.3%
Sub Total				\$115.09			\$115.53	\$0.44	0.4%	\$0.28	0.2%
HST				\$17.26			\$17.33	\$0.07	0.4%	\$0.04	0.2%
Provincial Rebate				(\$11.51)			(\$11.55)	(\$0.04)	(0.4%)	(\$0.03)	(0.2%)
TOTAL BILL				\$120.84			\$121.31	\$0.46	0.4%	\$0.29	0.2%

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-1

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.2: Residential (Domestic, winter time-of-day) Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹		1	\$18.82	\$18.82	1	\$18.82	\$18.82		
Demand Rate ¹									
Energy Rate 1 ¹	kWh	1,125	\$0.06468	\$72.77	1,125	\$0.06468	\$72.77		
Energy Rate 2 ¹	kWh	300	\$0.12638	\$37.91	300	\$0.12638	\$37.91		
Energy Rate 3 ¹	kWh	75	\$0.16435	\$12.33	75	\$0.16435	\$12.33		
FAM ¹	kWh	1,500	\$0.00698	\$10.47	1,500	\$0.00698	\$10.47		
DSM Cost Recovery	kWh	1,500	\$0.00587	\$8.81	1,500	\$0.00513	\$7.70	(\$1.11)	(12.6%)
Sub Total				\$161.10			\$159.99	(\$1.11)	(0.7%)
HST				\$24.17			\$24.00	(\$0.17)	(0.7%)
Provincial Rebate				(\$16.11)			(\$16.00)	\$0.11	0.7%
TOTAL BILL				\$169.16			\$167.99	(\$1.16)	(0.7%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,500	\$0.00513	\$7.70	1,500	\$0.00565	\$8.48	\$0.78	10.1%
Sub Total				\$159.99			\$160.77	\$0.78	0.5%
HST				\$24.00			\$24.12	\$0.12	0.5%
Provincial Rebate				(\$16.00)			(\$16.08)	(\$0.08)	(0.5%)
TOTAL BILL				\$167.99			\$168.81	\$0.82	0.5%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,500	\$0.00565	\$8.48	1,500	\$0.00624	\$9.36	\$0.88	10.4%	\$0.55	6.3%
Sub Total				\$160.77			\$161.65	\$0.88	0.5%	\$0.55	0.3%
HST				\$24.12			\$24.25	\$0.13	0.5%	\$0.08	0.3%
Provincial Rebate				(\$16.08)			(\$16.17)	(\$0.09)	(0.5%)	(\$0.06)	(0.3%)
TOTAL BILL				\$168.81			\$169.74	\$0.93	0.5%	\$0.58	0.3%

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-2

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.3: Residential (Domestic, non-winter time-of-day) Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹		1	\$18.82	\$18.82	1	\$18.82	\$18.82		
Demand Rate ¹									
Energy Rate 1 ¹	kWh	563	\$0.06468	\$36.38	563	\$0.06468	\$36.38		
Energy Rate 2 ¹	kWh	188	\$0.12638	\$23.70	188	\$0.12638	\$23.70		
Energy Rate 3 ¹									
FAM ¹	kWh	750	\$0.00698	\$5.24	750	\$0.00698	\$5.24		
DSM Cost Recovery	kWh	750	\$0.00587	\$4.40	750	\$0.00513	\$3.85	(\$0.55)	(12.6%)
Sub Total				\$88.54			\$87.98	(\$0.55)	(0.6%)
HST				\$13.28			\$13.20	(\$0.08)	(0.6%)
Provincial Rebate				(\$8.85)			(\$8.80)	\$0.06	0.6%
TOTAL BILL				\$92.96			\$92.38	(\$0.58)	(0.6%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	750	\$0.00513	\$3.85	750	\$0.00565	\$4.24	\$0.39	10.1%
Sub Total				\$87.98			\$88.37	\$0.39	0.4%
HST				\$13.20			\$13.26	\$0.06	0.4%
Provincial Rebate				(\$8.80)			(\$8.84)	(\$0.04)	(0.4%)
TOTAL BILL				\$92.38			\$92.79	\$0.41	0.4%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	750	\$0.00565	\$4.24	750	\$0.00624	\$4.68	\$0.44	10.4%	\$0.28	6.3%
Sub Total				\$88.37			\$88.81	\$0.44	0.5%	\$0.28	0.3%
HST				\$13.26			\$13.32	\$0.07	0.5%	\$0.04	0.3%
Provincial Rebate				(\$8.84)			(\$8.88)	(\$0.04)	(0.5%)	(\$0.03)	(0.3%)
TOTAL BILL				\$92.79			\$93.25	\$0.46	0.5%	\$0.29	0.3%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-3

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.4: Small General Bill Impacts

		2012 BILL			2013 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹		1	\$12.65	\$12.65	1	\$12.65	\$12.65		
Demand Rate ¹									
Energy Rate 1 ¹	kWh	200	\$0.13370	\$26.74	200	\$0.13370	\$26.74		
Energy Rate 2 ¹	kWh	300	\$0.11762	\$35.29	300	\$0.11762	\$35.29		
Energy Rate 3 ¹									
FAM ¹	kWh	500	\$0.01025	\$5.13	500	\$0.01025	\$5.13		
DSM Cost Recovery	kWh	500	\$0.01123	\$5.62	500	\$0.00828	\$4.14	(\$1.48)	(26.3%)
Sub Total				\$85.42			\$83.94	(\$1.48)	(1.7%)
HST				\$12.81			\$12.59	(\$0.22)	(1.7%)
Provincial Rebate							\$0.00	0.00	0.0%
TOTAL BILL				\$98.23			\$96.53	(\$1.70)	(1.7%)

#REF!		2013 BILL			2014 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	500	\$0.00828	\$4.14	500	\$0.00775	\$3.88	(\$0.26)	(6.4%)
Sub Total				\$83.94			\$83.68	(\$0.26)	(0.3%)
HST				\$12.59			\$12.55	(\$0.04)	(0.3%)
Provincial Rebate							\$0.00	0.00	0.0%
TOTAL BILL				\$96.53			\$96.23	(\$0.30)	(0.3%)

		2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	500	\$0.00775	\$3.88	500	\$0.00774	\$3.87	(\$0.01)	(0.2%)	(\$1.75)	(31.1%)
Sub Total				\$83.68			\$83.67	(\$0.01)	(0.0%)	(\$1.75)	(2.0%)
HST				\$12.55			\$12.55	(\$0.00)	(0.0%)	(\$0.26)	(2.0%)
Provincial Rebate							\$0.00	0.00	0.0%	\$0.00	0.0%
TOTAL BILL				\$96.23			\$96.22	(\$0.01)	(0.0%)	(\$2.01)	(2.0%)

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-4

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.5: General Demand Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kW	100	\$9.27600	\$927.60	100	\$9.27600	\$927.60		
Energy Rate 1 ¹	kWh	20,000	\$0.09904	\$1,980.80	20,000	\$0.09904	\$1,980.80		
Energy Rate 2 ¹	kWh	25,000	\$0.07006	\$1,751.50	25,000	\$0.07006	\$1,751.50		
Energy Rate 3 ¹									
FAM ¹	kWh	45,000	\$0.00756	\$340.20	45,000	\$0.00756	\$340.20		
DSM Cost Recovery	kWh	45,000	\$0.00457	\$205.65	45,000	\$0.00575	\$258.95	\$53.30	25.9%
Sub Total				\$5,205.75			\$5,259.05	\$53.30	1.0%
HST				\$780.86			\$788.86	\$7.99	1.0%
Provincial Rebate									
TOTAL BILL				\$5,986.61			\$6,047.90	\$61.29	1.0%

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	45,000	\$0.00575	\$258.95	45,000	\$0.00551	\$247.97	(\$10.98)	(4.2%)
Sub Total				\$5,259.05			\$5,248.07	(\$10.98)	(0.2%)
HST				\$788.86			\$787.21	(\$1.65)	(0.2%)
Provincial Rebate									
TOTAL BILL				\$6,047.90			\$6,035.28	(\$12.62)	(0.2%)

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	45,000	\$0.00551	\$247.97	45,000	\$0.00548	\$246.45	(\$1.52)	(0.6%)	\$40.80	19.8%
Sub Total				\$5,248.07			\$5,246.55	(\$1.52)	(0.0%)	\$40.80	0.8%
HST				\$787.21			\$786.98	(\$0.23)	(0.0%)	\$6.12	0.8%
Provincial Rebate											
TOTAL BILL				\$6,035.28			\$6,033.53	(\$1.75)	(0.0%)	\$46.92	0.8%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-5

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Date Revised: April 18, 2012

Line #

Table 3.6: Large General Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kVA	2,500	\$11.70200	\$29,255.00	2,500	\$11.70200	\$29,255.00		
Energy Rate 1 ¹	kWh	1,125,000	\$0.07040	\$79,200.00	1,125,000	\$0.07040	\$79,200.00		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹	kWh	1,125,000	\$0.00702	\$7,897.50	1,125,000	\$0.00702	\$7,897.50		
DSM Cost Recovery	kWh	1,125,000	(\$0.00202)	(\$2,272.50)	1,125,000	\$0.00243	\$2,736.68	\$5,009.18	220.4%
Sub Total				\$114,080.00			\$119,089.18	\$5,009.18	4.4%
HST				\$17,112.00			\$17,863.38	\$751.38	4.4%
Provincial Rebate									
TOTAL BILL				\$131,192.00			\$136,952.56	\$5,760.56	4.4%

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00243	\$2,736.68	1,125,000	\$0.00243	\$2,730.86	(\$5.82)	(0.2%)
Sub Total				\$119,089.18			\$119,083.36	(\$5.82)	(0.0%)
HST				\$17,863.38			\$17,862.50	(\$0.87)	(0.0%)
Provincial Rebate									
TOTAL BILL				\$136,952.56			\$136,945.87	(\$6.69)	(0.0%)

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00243	\$2,730.86	1,125,000	\$0.00252	\$2,839.08	\$108.22	4.0%	\$5,111.58	224.9%
Sub Total				\$119,083.36			\$119,191.58	\$108.22	0.1%	\$5,111.58	4.5%
HST				\$17,862.50			\$17,878.74	\$16.23	0.1%	\$766.74	4.5%
Provincial Rebate											
TOTAL BILL				\$136,945.87			\$137,070.32	\$124.45	0.1%	\$5,878.32	4.5%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-6

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Date Revised: April 18, 2012

Line #

Table 3.7: Small Industrial Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kVA	8	\$6.85400	\$52.09	8	\$6.85400	\$52.09		
Energy Rate 1 ¹	kWh	1,520	\$0.08650	\$131.48	1,520	\$0.08650	\$131.48		
Energy Rate 2 ¹	kWh	1,016	\$0.06848	\$69.58	1,016	\$0.06848	\$69.58		
Energy Rate 3 ¹									
FAM ¹	kWh	2,536	\$0.00664	\$16.84	2,536	\$0.00664	\$16.84		
DSM Cost Recovery	kWh	2,536	\$0.00506	\$12.83	2,536	\$0.00359	\$9.11	(\$3.72)	(29.0%)
Sub Total				\$282.82			\$279.10	(\$3.72)	(1.3%)
HST				\$42.42			\$41.86	(\$0.56)	(1.3%)
Provincial Rebate									
TOTAL BILL				\$325.24			\$320.96	(\$4.28)	(1.3%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	2,536	\$0.00359	\$9.11	2,536	\$0.00334	\$8.48	(\$0.63)	(6.9%)
Sub Total				\$279.10			\$278.47	(\$0.63)	(0.2%)
HST				\$41.86			\$41.77	(\$0.09)	(0.2%)
Provincial Rebate									
TOTAL BILL				\$320.96			\$320.24	(\$0.73)	(0.2%)

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	2,536	\$0.00334	\$8.48	2,536	\$0.00322	\$8.18	(\$0.31)	(3.6%)	(\$4.66)	(36.3%)
Sub Total				\$278.47			\$278.16	(\$0.31)	(0.1%)	(\$4.66)	(1.6%)
HST				\$41.77			\$41.72	(\$0.05)	(0.1%)	(\$0.70)	(1.6%)
Provincial Rebate											
TOTAL BILL				\$320.24			\$319.89	(\$0.35)	(0.1%)	(\$5.35)	(1.6%)

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-7

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.8: Medium Industrial Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kVA	100	\$11.03200	\$1,103.20	100	\$11.03200	\$1,103.20		
Energy Rate 1 ¹	kWh	45,000	\$0.06390	\$2,875.50	45,000	\$0.06390	\$2,875.50		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹	kWh	45,000	\$0.00638	\$287.10	45,000	\$0.00638	\$287.10		
DSM Cost Recovery	kWh	45,000	\$0.00448	\$201.60	45,000	\$0.00230	\$103.60	(\$98.00)	(48.6%)
Sub Total				\$4,467.40			\$4,369.40	(\$98.00)	(2.2%)
HST				\$670.11			\$655.41	(\$14.70)	(2.2%)
Provincial Rebate									
TOTAL BILL				\$5,137.51			\$5,024.81	(\$112.70)	(2.2%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	45,000	\$0.00230	\$103.60	45,000	\$0.00230	\$103.40	(\$0.20)	(0.2%)
Sub Total				\$4,369.40			\$4,369.20	(\$0.20)	(0.0%)
HST				\$655.41			\$655.38	(\$0.03)	(0.0%)
Provincial Rebate									
TOTAL BILL				\$5,024.81			\$5,024.58	(\$0.23)	(0.0%)

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	45,000	\$0.00230	\$103.40	45,000	\$0.00238	\$106.91	\$3.51	3.4%	(\$94.69)	(47.0%)
Sub Total				\$4,369.20			\$4,372.71	\$3.51	0.1%	(\$94.69)	(2.1%)
HST				\$655.38			\$655.91	\$0.53	0.1%	(\$14.20)	(2.1%)
Provincial Rebate											
TOTAL BILL				\$5,024.58			\$5,028.62	\$4.04	0.1%	(\$108.89)	(2.1%)

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-8

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Table 3.9: Large Industrial Bill Impacts

		2012 BILL			2013 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kVA	2,500	\$10.46900	\$26,172.50	2,500	\$10.46900	\$26,172.50		
Energy Rate 1 ¹	kWh	1,125,000	\$0.06369	\$71,651.25	1,125,000	\$0.06369	\$71,651.25		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹	kWh	1,125,000	\$0.00646	\$7,267.50	1,125,000	\$0.00646	\$7,267.50		
DSM Cost Recovery	kWh	1,125,000	\$0.00185	\$2,081.25	1,125,000	\$0.00148	\$1,669.98	(\$411.27)	(19.8%)
Sub Total				\$107,172.50			\$106,761.23	(\$411.27)	(0.4%)
HST				\$16,075.88			\$16,014.18	(\$61.69)	(0.4%)
Provincial Rebate									
TOTAL BILL				\$123,248.38			\$122,775.41	(\$472.96)	(0.4%)

		2013 BILL			2014 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00148	\$1,669.98	1,125,000	\$0.00150	\$1,692.74	\$22.76	1.4%
Sub Total				\$106,761.23			\$106,783.99	\$22.76	0.0%
HST				\$16,014.18			\$16,017.60	\$3.41	0.0%
Provincial Rebate									
TOTAL BILL				\$122,775.41			\$122,801.58	\$26.17	0.0%

		2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00150	\$1,692.74	1,125,000	\$0.00156	\$1,759.95	\$67.22	4.0%	(\$321.30)	(15.4%)
Sub Total				\$106,783.99			\$106,851.20	\$67.22	0.1%	(\$321.30)	(0.3%)
HST				\$16,017.60			\$16,027.68	\$10.08	0.1%	(\$48.19)	(0.3%)
Provincial Rebate											
TOTAL BILL				\$122,801.58			\$122,878.88	\$77.30	0.1%	(\$369.49)	(0.3%)

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-9

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.10: ELI 2P-RTP Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹	kVA	1	\$20,700.00	\$20,700.00	1	\$20,700.00	\$20,700.00		
Demand Rate ¹	kWh	1,500,000	\$0.06737	\$101,055.00	1,500,000	\$0.06737	\$101,055.00		
Energy Rate 1 ¹	kWh								
Energy Rate 2 ¹	kWh								
Energy Rate 3 ¹	kWh								
FAM ¹	kWh	1,500,000	\$0.00702	\$10,530.00	1,500,000	\$0.00702	\$10,530.00		
DSM Cost Recovery	kWh	1,500,000	\$0.00069	\$1,035.00	1,500,000	\$0.00000	\$0.00	(\$1,035.00)	(100.0%)
Sub Total				\$133,320.00			\$132,285.00	(\$1,035.00)	(0.8%)
HST				\$19,998.00			\$19,842.75	(\$155.25)	(0.8%)
Provincial Rebate									
TOTAL BILL				\$153,318.00			\$152,127.75	(\$1,190.25)	(0.8%)

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,500,000	\$0.00000	\$0.00	1,500,000	\$0.00000	\$0.00	\$0.00	0.0%
Sub Total				\$132,285.00			\$132,285.00	\$0.00	0.0%
HST				\$19,842.75			\$19,842.75	\$0.00	0.0%
Provincial Rebate									
TOTAL BILL				\$152,127.75			\$152,127.75	\$0.00	0.0%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,500,000	\$0.00000	\$0.00	1,500,000	\$0.00000	\$0.00	\$0.00	0.0%	(\$1,035.00)	(100.0%)
Sub Total				\$132,285.00			\$132,285.00	\$0.00	0.0%	(\$1,035.00)	(0.8%)
HST				\$19,842.75			\$19,842.75	\$0.00	0.0%	(\$155.25)	(0.8%)
Provincial Rebate											
TOTAL BILL				\$152,127.75			\$152,127.75	\$0.00	0.0%	(\$1,190.25)	(0.8%)

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-10

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.11: Municipal Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kVA	2,500	\$10.91000	\$27,275.00	2,500	\$10.91000	\$27,275.00		
Energy Rate 1 ¹	kWh	1,125,000	\$0.06369	\$71,651.25	1,125,000	\$0.06369	\$71,651.25		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹	kWh	1,125,000	\$0.00652	\$7,335.00	1,125,000	\$0.00652	\$7,335.00		
DSM Cost Recovery	kWh	1,125,000	\$0.00490	\$5,512.50	1,125,000	\$0.00518	\$5,828.62	\$316.12	5.7%
Sub Total				\$111,773.75			\$112,089.87	\$316.12	0.3%
HST				\$16,766.06			\$16,813.48	\$47.42	0.3%
Provincial Rebate									
TOTAL BILL				\$128,539.81			\$128,903.35	\$363.54	0.3%

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00518	\$5,828.62	1,125,000	\$0.00529	\$5,946.99	\$118.37	2.0%
Sub Total				\$112,089.87			\$112,208.24	\$118.37	0.1%
HST				\$16,813.48			\$16,831.24	\$17.75	0.1%
Provincial Rebate									
TOTAL BILL				\$128,903.35			\$129,039.47	\$136.12	0.1%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,125,000	\$0.00529	\$5,946.99	1,125,000	\$0.00554	\$6,227.84	\$280.85	4.7%	\$715.34	13.0%
Sub Total				\$112,208.24			\$112,489.09	\$280.85	0.3%	\$715.34	0.6%
HST				\$16,831.24			\$16,873.36	\$42.13	0.3%	\$107.30	0.6%
Provincial Rebate											
TOTAL BILL				\$129,039.47			\$129,362.45	\$322.98	0.3%	\$822.64	0.6%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-11

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.12: Unmetered Bill Impacts

		2012 BILL			2013 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kW	0.250	\$9.33900	\$2.33	0	\$9.33900	\$2.33		
Energy Rate 1 ¹	kWh	100	\$0.10680	\$10.68	100	\$0.10680	\$10.68		
Energy Rate 2 ¹	kWh		\$0.07091	\$0.00	0	\$0.07091	\$0.00		
Energy Rate 3 ¹									
FAM ¹	kWh	100	\$0.00710	\$0.71	100	\$0.00710	\$0.71		
DSM Cost Recovery	kWh	100	(\$0.00201)	(\$0.20)	100	\$0.01433	\$1.43	\$1.63	813.0%
Sub Total				\$13.52			\$15.16	\$1.63	12.1%
HST				\$2.03			\$2.27	\$0.25	12.1%
Provincial Rebate									
TOTAL BILL				\$15.55			\$17.43	\$1.88	12.1%

		2013 BILL			2014 BILL			CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	100	\$0.01433	\$1.43	100	\$0.01415	\$1.42	(\$0.02)	(1.2%)
Sub Total				\$15.16			\$15.14	(\$0.02)	(0.1%)
HST				\$2.27			\$2.27	(\$0.00)	(0.1%)
Provincial Rebate									
TOTAL BILL				\$17.43			\$17.41	(\$0.02)	(0.1%)

		2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
	Metric	Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	100	\$0.01415	\$1.42	100	\$0.01391	\$1.39	(\$0.02)	(1.7%)	\$1.59	792.3%
Sub Total				\$15.14			\$15.12	(\$0.02)	(0.2%)	\$1.59	11.8%
HST				\$2.27			\$2.27	(\$0.00)	(0.2%)	\$0.24	11.8%
Provincial Rebate											
TOTAL BILL				\$17.41			\$17.38	(\$0.03)	(0.2%)	\$1.83	11.8%

¹ Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-12

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.13: Bowater Mersey (AE only) Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹	kW	10,000	\$5.50000	\$55,000.00	10,000	\$5.50000	\$55,000.00		
Energy Rate 1 ¹	Costs	100,000	\$0.45000	\$45,000.00	100,000	\$0.45000	\$45,000.00		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹									
DSM Cost Recovery	kWh	1,000,000	\$0.00066	\$660.00	1,000,000	\$0.00094	\$938.70	\$278.70	42.2%
Sub Total				\$100,660.00			\$100,938.70	\$278.70	0.3%
HST				\$15,099.00			\$15,140.80	\$41.80	0.3%
Provincial Rebate									
TOTAL BILL				\$115,759.00			\$116,079.50	\$320.50	0.3%

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	1,000,000	\$0.00094	\$938.70	1,000,000	\$0.00097	\$969.18	\$30.48	3.2%
Sub Total				\$100,938.70			\$100,969.18	\$30.48	0.0%
HST				\$15,140.80			\$15,145.38	\$4.57	0.0%
Provincial Rebate									
TOTAL BILL				\$116,079.50			\$116,114.56	\$35.06	0.0%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	1,000,000	\$0.00097	\$969.18	1,000,000	\$0.00102	\$1,022.33	\$53.15	5.5%	\$362.33	54.9%
Sub Total				\$100,969.18			\$101,022.33	\$53.15	0.1%	\$362.33	0.4%
HST				\$15,145.38			\$15,153.35	\$7.97	0.1%	\$54.35	0.4%
Provincial Rebate											
TOTAL BILL				\$116,114.56			\$116,175.68	\$61.12	0.1%	\$416.68	0.4%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-13

E-ENSC-R-12

Date Revised: April 18, 2012

Line #

Table 3.14: Gen. Repl. / Load Foll. Bill Impacts

	Metric	2012 BILL			2013 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
Monthly Service Charge ¹									
Demand Rate ¹									
Energy Rate 1 ¹	kWh	50,000	\$0.05332	\$2,666.00	50,000	\$0.05332	\$2,666.00		
Energy Rate 2 ¹									
Energy Rate 3 ¹									
FAM ¹									
DSM Cost Recovery	kWh	50,000	\$0.00021	\$10.50	50,000	\$0.00088	\$43.96	\$33.46	318.6%
Sub Total				\$2,676.50			\$2,709.96	\$33.46	1.3%
HST				\$401.48			\$406.49	\$5.02	1.3%
Provincial Rebate									
TOTAL BILL				\$3,077.98			\$3,116.45	\$38.48	1.3%

	Metric	2013 BILL			2014 BILL			CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%
DSM Cost Recovery	kWh	50,000	\$0.00088	\$43.96	50,000	\$0.00091	\$45.38	\$1.43	3.2%
Sub Total				\$2,709.96			\$2,711.38	\$1.43	0.1%
HST				\$406.49			\$406.71	\$0.21	0.1%
Provincial Rebate									
TOTAL BILL				\$3,116.45			\$3,118.09	\$1.64	0.1%

	Metric	2014 BILL			2015 BILL			CHANGE IMPACT		CUMULATIVE CHANGE IMPACT	
		Volume	Rate	Charge	Volume	Rate	Charge	\$	%	\$	%
DSM Cost Recovery	kWh	50,000	\$0.00091	\$45.38	50,000	\$0.00096	\$47.87	\$2.49	5.5%	\$37.37	355.9%
Sub Total				\$2,711.38			\$2,713.87	\$2.49	0.1%	\$37.37	1.4%
HST				\$406.71			\$407.08	\$0.37	0.1%	\$5.61	1.4%
Provincial Rebate											
TOTAL BILL				\$3,118.09			\$3,120.95	\$2.86	0.1%	\$42.98	1.4%

1 Source: Nova Scotia Power Inc. Tariffs & Regulations Effective January 1, 2012

Attachment 3-14

E-ENSC-R-12

Date Revised: April 18, 2012

EPS

Detailed Review of completed energy efficiency projects at New Page, Port Hawkesbury

for Efficiency Nova Scotia Corporation

October 17, 2011

EPS

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Appendices

Appendix 1 – Preliminary Review of Energy Efficiency Projects at NPPH (Feb. 2011)

Appendix 2 – “Draft” Superior Energy Performance, Plant Measurement & Verification Protocol *Note to Auditor: This protocol is being provided solely for the purposes of verification of energy efficiency projects at New Page Port Hawkesbury. Reproduction and re-use for any other purpose is strictly forbidden.*

Appendix 3 – Excel files with regression analyses (for verification entity):

- NPPH mill regressions Rev4 TR
- NPPH PM2 regressions TR

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EXECUTIVE SUMMARY

During the period of January to March, 2011 Energy Performance Services (EPS/Canada) Inc. (“EPS”) carried out a preliminary review of energy efficiency projects undertaken at the New Page Port Hawkesbury (“NPPH”) and Abitibi Bowater Liverpool (“ABL”) facilities. EPS issued a report on March 21, 2011 summarizing its findings at that time.

In July 2011, EPS was contracted by Efficiency Nova Scotia Corporation (“ENSC”) to complete a detailed Measurement & Verification (M&V) of energy and demand savings from energy efficiency projects at NPPH and to conduct a preliminary analysis of the savings from both recently completed and potential projects at ABL. This report provides a summary of the detailed M&V of the completed energy efficiency projects at the NPPH facility only.

Our approach to verification has been primarily based on application of the *Superior Energy Performance, Plant Measurement & Verification Protocol* (SEP M&V Protocol) found in Appendix-2. We find that this protocol is excellent for verification of energy savings in a large industrial facility. We have also referenced the key requirements of the International Performance Measurement and Verification Protocol (IPMVP) by the Efficiency Valuation Organization (EVO).

A summary of the results presented in this Report is found on in Table 1. Using the Top-Down method defined under the SEP M&V Protocol, which is consistent with the “whole facility” method defined under IPMVP, we estimate the energy savings from energy efficiency projects implemented at NPPH to be 154.2 GWh per year and the average electricity demand savings to be 17.8 MW.

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Table 1 - Summary of Results

#	Project Title	Project Start	Adjusted INITIAL REPORT estimate		Bottom-up estimate based on statistical energy analysis		Top-down Estimate	
			GWh	MW	GWh	MW	GWh	MW
1	Upgrade Line 1 Refiner*	2010	63.9	7.3	53.4	6.1		
2	Optimize Line 3 Production**	Mid 2008	9.8	1.1	59.6	6.8		
3	Optimize Rejects Screening**	Sep 09	16.8	2.0				
4	Bypass Noss Cleaners (Not completed)***	Sep 2011	11.30	1.35	N/A	N/A		
5	PM2 Vacuum Blower Power Reduction	Late 2009	12.60	1.5	9.04	1.03		
	TOTAL (incl. project 4)		114.4	13.25				
	TOTAL (excl. project 4)		103.1	11.9	122.0	13.9	154.2	17.8

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1. INTRODUCTION

In February 2011, Energy Performance Services (EPS) was contracted by Efficiency Nova Scotia Corporation (ENSC) to perform a preliminary review of the energy consumption and demand savings from energy efficiency projects undertaken at the two largest pulp & paper mills in Nova Scotia, namely New Page Port Hawkesbury (“NPPH”) and Abitibi Bowater Liverpool (“ABL”). In March, 2011 a report was issued by EPS to ENSC summarizing the results of its preliminary investigation (“the INITIAL REPORT”).

In July of 2011, ENSC contracted EPS to carry out a detailed M&V (Measurement & Verification) of energy and demand savings from the energy efficiency projects at NPPH identified in the INITIAL REPORT and to carry out a preliminary evaluation of energy efficiency projects at ABL. The main purpose of our work has been to check the validity of the preliminary estimates that were provided in the INITIAL REPORT which were based on self-reported energy performance numbers from NPPH, but not independently audited at the time of the report. We have concluded that the energy efficiency project savings at NPPH are substantial and therefore this October 2011 report (“M&V REPORT”) focuses exclusively on the energy efficiency projects implemented at NPPH. A summary of the results of our evaluation at ABL will be provided in a separate report. Peter Bassett & sub-consultant Tom Ryan .ing of SyENERGY Integrated Energy Solutions Inc. are the key individuals who have worked on this assignment on behalf of EPS.

In order to carry out this mandate, our team has worked closely with NPPH to obtain historical operating and energy data and interpret this data in light of the energy efficiency projects that were completed during the period of (July 2008 to August 2011). Our evaluation has attempted to ensure that important changes to production patterns or operating practices that occurred during the period of our evaluation are accounted for and do not mask or distort the energy savings picture. In order to evaluate the energy savings results from the energy efficiency projects, we have built multi-variable regression models so that we can normalize data and evaluate energy savings across operating periods when different production activity and operating practices were occurring. In carrying out this analysis, we have worked closely with NPPH in order to ensure that we have reasonably understood the differences in patterns and activity occurring before, during and after the time when the energy efficiency projects were implemented. We are grateful for the cooperation provided by NPPH in facilitating this level of investigation.

The reader will find project-specific energy savings estimates and a description of the methodology used in deriving these estimates for each of the projects identified in the INITIAL REPORT. This M&V REPORT provides an energy performance evaluation for the whole of the mill based on an analysis of the historical energy and production data over a 4 year period starting in June 2007 and running to present. TMP and Paper mills

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are complex and dynamic operations. Our assessment has therefore required the construction of models in order to account for these factors so that at the end of the day we can compare “apples to apples” when looking at different periods. The result is an energy savings estimate which takes account of variations in a large number of independent variables over the analysis period. Some of the critical variables that we have had to take account of include:

- Variations in paper production
- Variations in TMP pulp production
- Variations in the % of TMP pulp used in the finished paper vs. purchased Kraft pulp and clay

It is important to stress that, as per the guidance of the SEP and IMPVP protocols, the savings estimates quantify **avoided energy use** under a set of normalized operating conditions due to efficiency improvements, **not** absolute energy savings.

2. MILL CONFIGURATION WITH KEY PROCESS UNITS

Figure 1 below shows the NPPH mill schematic with the main operating units (the “FACILITY”). From a production point of view, the key operating units are: (a) the TMP plant (includes the bleach plant and heat recovery unit) and; (b) Paper Machines 1 and 2. Important service units include: (c) the power boilers (PB3 & PB4) (Power Boiler 4 (PB4) is only used for standby purposes and rarely runs); (d) the effluent treatment plant and; (e) the wood yard (not shown).

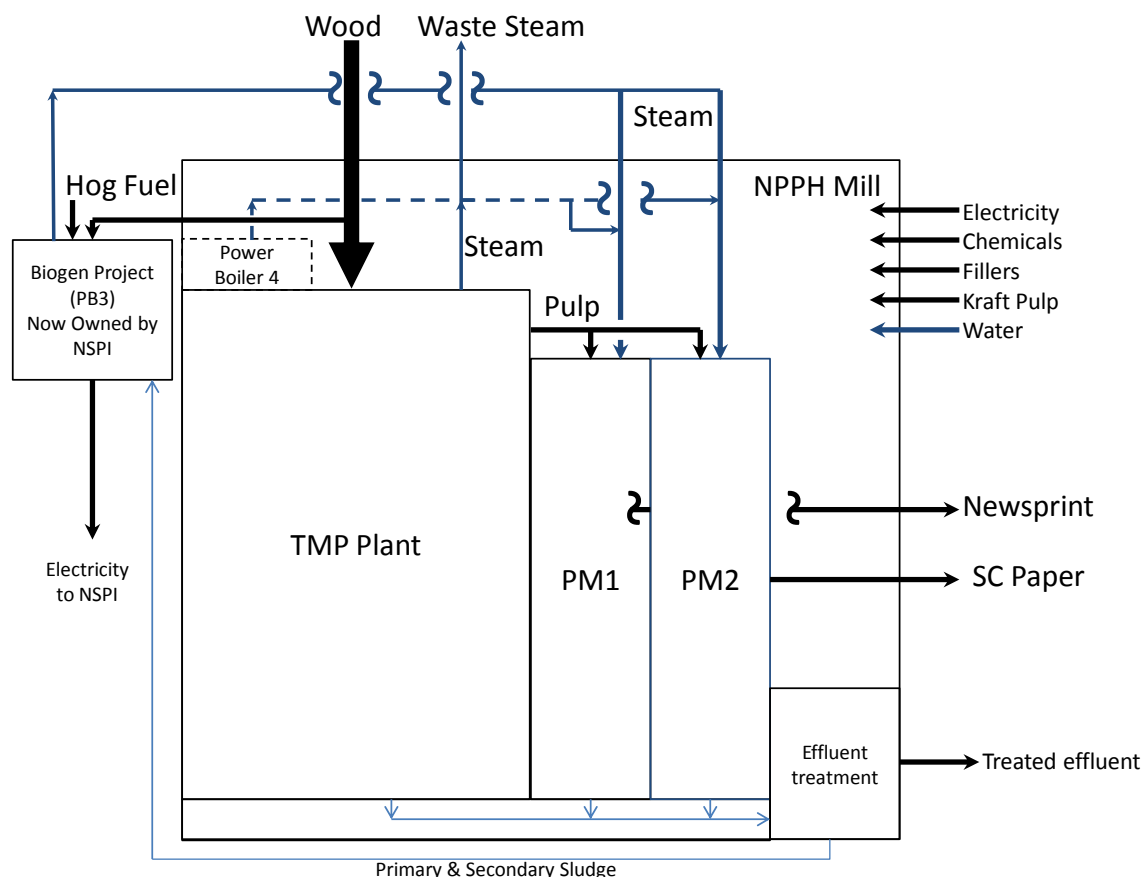


Figure 1- NPPH Mill Schematic Showing Main Operational Units

The power boilers PB3 & PB4 are located in a plant where electric power can be generated through a steam turbine. Any electric power generated by the steam turbine is 100% exported to the provincial grid and therefore does not factor into the electricity purchases of NPPH. PB3 has very recently (summer 2011) been sold to Nova Scotia Power Inc. (NSPI). Despite the uncertainties currently surrounding the mill's future, NSPI is modernising PB3 to upgrade its generating capacity and the project is still active, with an expected completion date of December 2012. Upon completion, this \$80 M capital investment project, referred to as the "Biogen Project" by NSPI is expected to produce 60 MW of electricity for the provincial grid. It will provide some of the steam requirements for the NPPH mill, but it will also be coupled with an initiative by NPPH to significantly reduce the waste TMP steam that is currently vented to atmosphere. Prior to the current shutdown, 35-50% (≈ 8.0 - 11.4 kg/s) of TMP steam was being vented to atmosphere as waste heat.

An approximate breakdown of the electricity consumption of the FACILITY according to the process units shown in figure 1 is found in Table 2 below. This breakdown is based on Standard Conditions of *1400 tonnes/d of paper average, 365 days/year, 10°C*. These Standard Conditions have been chosen because they are very close to the median and

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average paper production conditions that occur throughout the year. (See section 4 for the definition of the term *standard conditions* under the SEP M&V Protocol).

Table 2 – Approximate breakdown of electricity consumption by operational units for standard conditions (1400 tonnes/d of paper average, 365 days/year, 10°C)

Operational unit	% consumption	MW*
TMP (mainline & rejects refiners only)	67.4%	118.7
TMP (non-refining)	8.9%	15.6**
TMP total	76.3%	134.4
PM1	11.9%	21 (20)
PM2	6.0%	10.5 (10)
Power Boiler 3 (before sale to NSPI)	2.3%	4.0
Auxiliary Services (water treatment, compressed air, woodyard, lighting)	3.6%	6.3 (5.5)
Total	100%	176.2

*: All data other than TMP refining energy, which is recorded continuously, has been supplied by Mark Frith, TMP plant manager. When a number in brackets appears, adjustments have been made to M. Frith's PM1, PM2 & services estimates to match predicted and total mill consumption at standard conditions.

**: TMP Line 1 & 2 aux. equipment: approx. 6.0 MW, TMP line 3 & rejects refiners aux. equipment + bleach plant: approx 9.6 MW.

2.1 TMP plant flowsheets

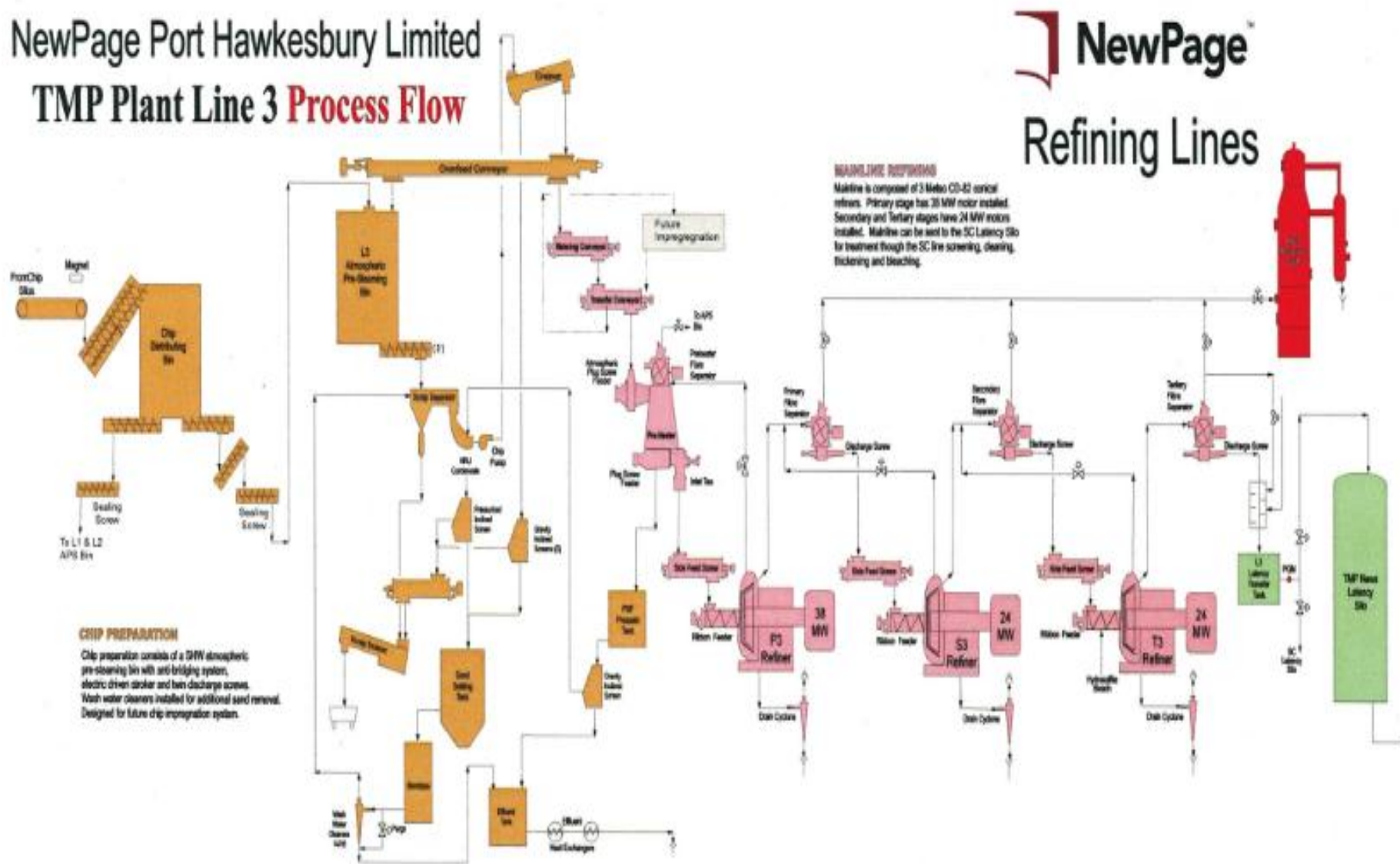
As the TMP plant is the largest electricity consuming operating unit at the FACILITY, we have included simplified process diagrams of the TMP plant in figures 2 through 5 below:

- Figure 2 shows line 1 & 2 chip handling and refining
- Figure 3 shows line 3 chip handling and refining
- Figure 4 shows the bleaching system (note pulp from line 3 is not bleached)
- Figure 5 shows the pulp screening, cleaning and rejects refining systems

Figure 2

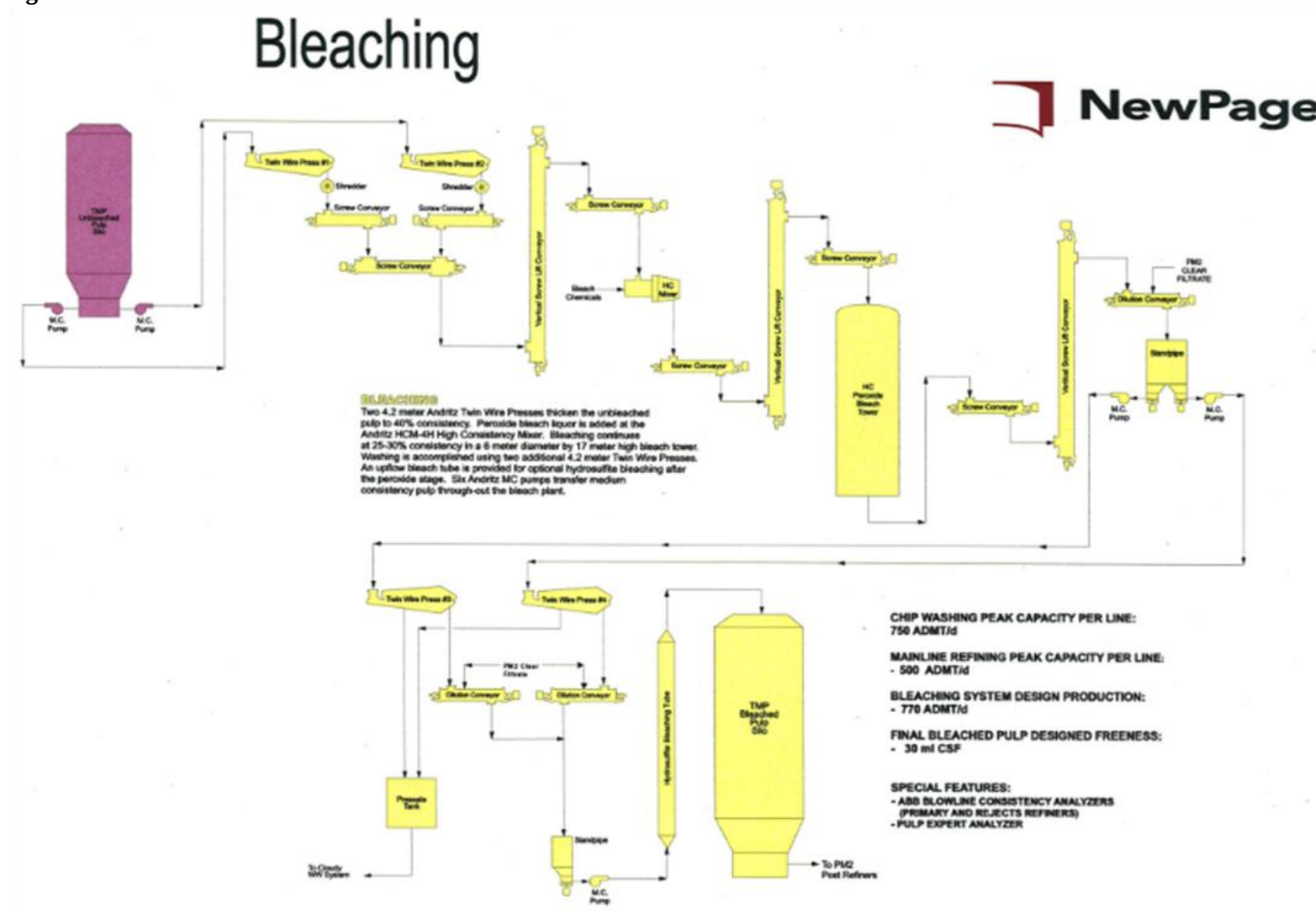


NewPage Port Hawkesbury Limited
TMP Plant Line 3 Process Flow



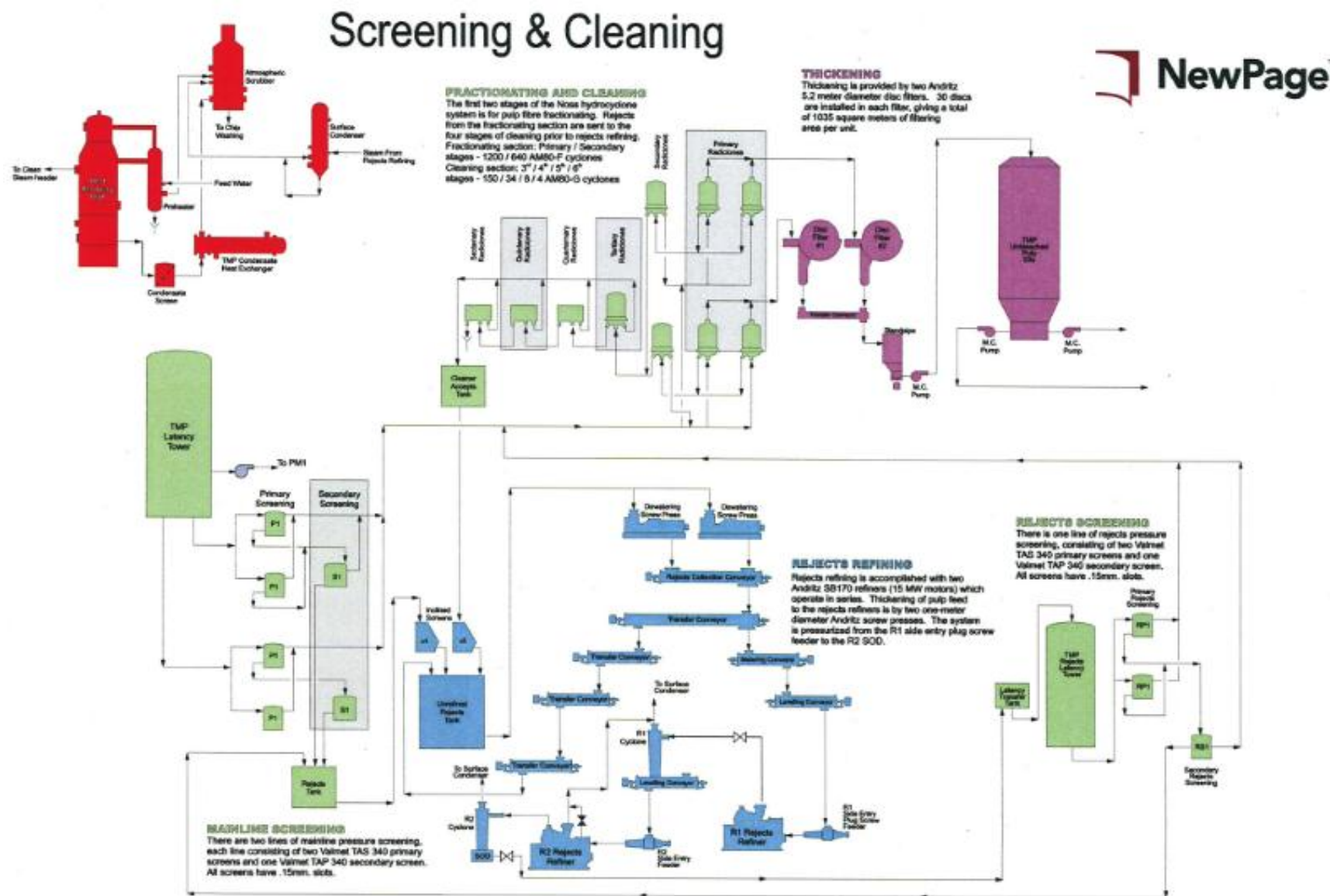
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Figure 4



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Figure 5



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3. PROJECTS CONSIDERED

While NPPH is always in the process of continuous improvement with respect to energy and other raw materials consumption, only a limited number of projects were considered as part of the INITIAL REPORT. These were estimated in the INITIAL REPORT and are summarized in Table 3. Projects that were not found to produce savings in the INITIAL REPORT have been dropped from Table-3 entirely. The scope of energy efficiency projects considered in the M&V REPORT is summarized below.

Table 3– Projects found to significantly affect energy consumption, INITIAL REPORT

#	Project Title	Year started	Feb 2011 estimate based on preliminary projects review		Comments
			GWh	MW	
1	Upgrade Line 1 Refiner	2010	74.00	8.5	Start-up June 30, 2010. Because of capacity increase and specific energy decrease, production mix from 3 lines is affected.
2	Optimize Line 3 Production	Mid 2008*	9.80	1.1	Reduced since there is an overlap with Line 1 refiner upgrade project. Savings shown are from mid 2009 to end of 2010.
3	Optimize Rejects Screening	Sep 09-Jun 11	16.80	2.0	Savings come from reduced recirculation to reject refiners.
4	Bypass Noss Cleaners**	Feb-Sep 2011	11.30	1.35	Initial trials done with the support of Paprican show the cleaners can be bypassed while maintaining paper quality. Expected number is discounted by 25% due to some uncertainty.
5	PM2 Vacuum Blower Power Reduction+ other PM2 improvements	Late 2009	12.60	1.5	Conservative estimate. Blower alone produced at least 1.2 MW in savings. Overall PM2 load reduction at transformer from late 2009 to end of 2010 is 1.5-2.0 MW
	TOTAL		124.50	14.45	

* This date had been listed as Mid 2009 in the INITIAL REPORT. See section 4.4 for a detailed explanation of why the date was changed to Mid 2008.

** Though the mill had done much work on this project prior to the September 2011 shutdown, it was not yet operational, and therefore the estimate is only valid in that it shows the potential savings, not actual ones.

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The first 4 projects listed above, or *Energy Conservation Measures (ECMs)* in the IPMVP jargon, are all fully within the TMP plant. The fifth and final project took place outside of the TMP plant, in the PM2 section of the mill.

4. EVALUATION PROTOCOL & METHODOLOGY

We have principally relied on the *Superior Energy Performance (SEP)* measurement & verification protocol found in Appendix-1 in conducting the M&V evaluation. We have relied on this document as it is very instructional in specifically approaching M&V for industrial facilities, especially large complex industrial process facilities. We have also used elements of the *International Performance Measurement and Verification Protocol (IPMVP)* developed by the Efficiency Valuation Organization (EVO)¹ when it provides complementary guidance.

It is very useful to adapt the methodology of the SEP and IPMVP protocols to deliver a high level and high-quality assessment of the energy performance improvements made by NPPH. The main purpose of our work has been to check the validity of the preliminary estimates that were provided in the INITIAL REPORT which were based on self-reported energy performance numbers from NPPH, but not independently audited at the time of the report.

In the SEP approach to energy performance evaluation, two different components are required for the analysis:

- The first component is **top-down** energy performance assessment, which is facility-level (or sub-facility level) performance calculated from energy consumption data at the whole facility level. If detailed metered energy data was available for the TMP plant alone (the sub-facility in NPPH's case), we would be able to do the analysis on the TMP plant alone, but unfortunately we only have metered data at the whole facility level, so we have done the top-down analysis for the whole mill. The Top-down analysis is found in Section-5 of the M&V REPORT.
- The second component is **bottom-up** energy performance assessment, which is facility-level performance calculated by analysis of individual changes made at the facility. The SEP M&V protocol does not require detailed bottom-up analysis, but does require a high-level bottom-up "sanity check" of the top-down result.² In NPPH's case, we will look at the aggregate of three TMP energy improvement projects from the bottom up, plus one project that took place within the PM2 plant. The bottom-up analysis is found in Section-6 of the M&V REPORT.

It may be useful to note that we have used what is referred to in section 3.1.3 of the SEP protocol as the "***standard conditions***" approach to comparing the energy performance after project improvements with the baseline period. To cite the SEP protocol, this method "***compare(s) the***

¹ Concepts and Options for Determining Energy and Water Savings, Volume 1, Efficiency Valuation Organization, www.evo-world.org, September 2010, EVO 10000 – 1:2010

² Superior Energy Performance, Plant Measurement and Verification Protocol (Draft) February 25, 2011 , p.1-1
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adjusted reporting-period consumption to the adjusted baseline-period consumption. The adjusted consumption for each period is the estimated energy consumption that would have been expected at a standard set of production levels and external factors, if the operating equipment and practices of each period were in place. Each estimate is the result of a model of energy consumption fit to consumption data for the period, and applied at standard conditions.

All data collected and analysed for this report used daily time weighted averages for each 24 hour data point. Based on our analysis of the data and key efficiency project milestones, we have broken the reporting period into 3 distinct segments. The 3 periods are defined below in Table-4. The baseline period is 13 months long, the middle period is almost exactly 2 years long and the latest period is a little over 13 months long. The detailed rationale behind this breakdown will be discussed later in the report. For brevity's sake, we refer to these periods as Year 1 (baseline), Years 2-3 and Year 4. Table 4 shows the three periods with adjusted production averages based on actual data. Note that the daily averages are for days where good data was available. Since a limited number of data points were unusable because of reporting errors or suspect data, these were eliminated from the data set to avoid skewing the mathematical models. Annualized production numbers were adjusted to compensate for the eliminated data points.

Table 4 – Reporting periods and standard conditions

Year	Period Start	Period End	Paper actual avg. Tonnes/ yr & day	TMP actual avg. ADMT/ yr & day
Yr 1	Jun 1, 2007	Jun 30, 2008	515,842 1,413.3	435,250 1,193.5
Yr 2-3	Jul 1, 2008	Jun 29, 2010	489,283 1,340.5	434,658 1,191.7
Yr 4	Jun 30, 2010	Aug 9, 2011	526,940 1,443.7	478,650 1,311.4
Standard conditions			511,000 1,400	451,797 1,237.8

Both the top-down and bottom-up components of the evaluation rely heavily on statistical analysis of historical energy consumption and other key performance data. In the IPMVP framework, the top-down approach is referred to as the “whole facility” evaluation method, whereas the bottom-up approach is closest to the “retrofit isolation” method. For this report, we have analyzed historical energy consumption and the key variables that affect it, such as paper production, final pulp freeness, outdoor temperature, etc, and constructed mathematical models in order to derive equations that match the actual data as closely as possible. These models are constructed using a multi-variable linear regression analysis program built to be used within the Microsoft Excel 2007 environment.

If we try to construct a mathematical model for a period of about 2 years where no major process changes are implemented, it is generally possible to get very good agreement between the actual data and the mathematically predicted data. If on the other hand, we try to model performance for a similar period which contained major process changes, the model will have some difficulty accurately predicting energy consumption. We may also see a major step change in energy consumption around the time the process changes were implemented. *It therefore becomes more accurate to construct two mathematical models: one for the period before the process changes (the “before” model) and one for the period after the changes (the “after” model). Once these two models have been constructed, we use the before*

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*model to predict what the energy consumption would have been had the process changes not been implemented (often referred to as the baseline) and we compare this to both the actual energy consumption after the project was implemented and the energy consumption predicted by the after model. We refer to this analysis approach as **Top-Down** evaluation.*

In the final step of our analysis, we compare the top-down to both the individual projects bottom-up numbers and the estimates that were provided in the INITIAL REPORT. The purpose of this comparison is to provide a “sanity check” as per the requirements of the SEP M&V protocol.

Only the top-down analysis provides an all-inclusive estimate of energy performance improvement for the whole FACILITY. Even though some energy efficiency projects that were considered in the INITIAL REPORT have been dropped from the analysis, any small improvements that they may have contributed (or negative effects they may have had on energy performance) have been captured in the top-down analysis. This component of the analysis aggregates all facility changes over the reporting period and provides a true picture of performance because it is based on actual metered energy consumption data from the period.

4.1 Measurement Boundaries

The measurement boundary for all projects is the whole mill. Note that the reported refining energy consumption does not include electrical consumption of any auxiliary equipment located within the TMP plant. The reason for this is that the aggregate TMP plant consumption including auxiliary equipment is not metered. The mill does continuously record refining energy consumption for all mainline & rejects refiners and the rejects post refiner, with typical recording intervals of between 1 and 10 seconds. It is therefore easy to obtain highly accurate time weighted data for tracking refiner electricity consumption.

As seen in table 2, it is estimated that the TMP plant auxiliary equipment, including the bleach plant, consumes 15.6 MW, or on average 11.5% of the TMP plant’s electrical consumption. We estimate the typical variability of this portion of the TMP plant’s consumption is of the order of $\pm 20\%$ or 3.1 MW. Because this represents approximately 2.3% of the TMP plant’s average load, it can be ignored, as per the IPMVP guidelines which set 5% as the threshold for required inclusion.

The measurement boundary for the top-down analysis is the whole of the NPPH mill facility, including PB3. In future, the mill boundary will probably exclude PB3, since it has recently been transferred to NSPI ownership.

4.2 Analysis Procedure

For the purposes of the various analyses required to carry out our mandate, we have built a data model using daily time weighted average numbers for a large number of process parameters at the NPPH mill. The data set spans over 4 years, beginning on June 1, 2007 and ending on August 8, 2011. We have used a multi-variable linear regression analysis tool that allows us to efficiently

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process large volumes of time dependent data to develop statistically rigorous linear regression models to derive mathematical equations based on key variables that drive energy consumption. A copy of the excel file with modelling results is provided as Appendix-3 of the M&V REPORT. An overview of the contents of the modelling file is as follows:

Table 5 – Contents of regression analysis modelling files

Tab	Content	Purpose
<i>Appendix 3a) NPPH Mill Regressions (Rev 4) – All modeling work except PM2 blower project</i>		
Tab-1	PI system vs NSPI bills	Check accuracy & validity of energy data in PI system
Tab-2	NSPI bill for month of January 2010	Provide actual billing data for Verification Entity
Tab-3	NSPI bill for month of January 2011	Provide actual billing data for Verification Entity
Tab-4	First Total Energy Regression	First iteration to identify key parameters
Tab-5	Zero-Intercept Total Energy Regression	Study the impact of forcing regression equation through Zero Y-Axis intercept
Tab-6	CSF Impact	Analyse regression equations to see if freeness is statistically significant
Tab-7	First Refining Energy Regression	Produce a model over the 4+ year data set to identify periods where energy performance transitions occur
Tab-8	Second Refining Energy Regression	Improve quality of regressions by removing data points with obvious errors
Tab-9	Second Total Energy Regression (with refining energy as a part of equation)	See if including refining energy in equation improves the model significantly, and provides relevant info
Tab-10	Refining energy regression for year 1 (including ambient temperature as factor)	Derive refining energy model for baseline period
Tab-11	Refining energy regression for year 1 (excluding ambient temperature as factor)	Evaluate if ambient temperature affects refining energy
Tab-12	Total energy regression for year 1	Derive total mill electrical energy model for year 1
Tab-13	Refining energy regression for years 2-3 (including ambient temperature as factor)	Derive refining energy model for year 2-3 period
Tab-14	Refining energy regression for years 2-3 (excluding ambient temperature as factor)	Evaluate if ambient temperature affects refining energy
Tab-15	Refining energy regression for years 2-3 with removal of data points with highest residuals (extra data cleaning)	Investigate if removing the data points furthest from the model improves the model accuracy
Tab-16	Total energy regression for years 2-3	Derive total mill electrical energy model for years 2-3
Tab-17	Refining energy regression for year 4 (including ambient temperature as factor)	Derive refining energy model for year 4 period
Tab-18	Refining energy regression for year 4 (excluding ambient temperature as factor)	Evaluate if ambient temperature affects refining energy

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Tab	Content	Purpose
Tab-19	Total energy regression for year 4	Derive total mill electrical energy model for year 4
Tab-20	Base	Tab required by software to run models
Tab-21	Deletions	Tab required by software to run models
Tab-22	Inputs	Where raw data is filtered and manipulated, providing a template for the regression analysis
Tab-23	Model Plots	Produce graphs of several energy models over a range of production conditions, so they can be compared
Tab-24	Raw Data	Location where raw data from the mill was imported
<i>Appendix 3b) NPPH PM2 Regressions</i>		
Tab-1	Baseline regression, 4 blowers	Obtain blower energy regression equation in baseline period
Tab-2	Year 4 regression, 3 or 4 blowers	Obtain blower energy regression equation in reporting period (year 4)
Tab-3	Inputs	Where raw data is filtered and manipulated, providing a template for the regression analysis
Tab-4	Base	Tab required by software to run models
Tab-5	Deletions	Tab required by software to run models
Tab-6	Raw Data	Location where raw data from the mill was imported

Depending on a number of factors, such as data accuracy, process consistency and parameter relevance as drivers of energy consumption, the mathematical model will match the actual data to a degree which may range from excellent to very poor. Part of the modeling exercise involves studying the data sets and eliminating clearly erroneous data which would otherwise skew the mathematical model. In some cases, it is easy to spot wrong data. One example of this occurs when production units that are clearly not in operation show non-zero production or energy consumption. In some instances erroneous data that is not easy to identify can be picked up by the model. For example, data points for which the result predicted by the model is more than 3 standard deviations away from the actual measured parameter are typically fairly suspect in nature.

A second part of the exercise involves testing whether certain independent variables such as outdoor temperature are relevant to the model. If the parameters have a significant effect on energy performance, the model should include those variables in its equations. If they are found not to have a significant effect, they should not be included.

A number of parameters, such as the standard deviation, R squared and P-value provide an indication of the quality of the model in predicting energy consumption. The graphical display of the Cumulative SUM of deviations (CUSUM) over a period of time can provide very useful

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indications of whether a facility's energy performance is improving or deteriorating over time and how rapidly these changes are occurring. With all of these tools, some experience is required in order to properly interpret the energy data and draw conclusions about the facility's energy performance.

4.3 Data analyzed

As discussed, EPS obtained daily averages for key operating and energy consumption variables for at least one full year prior to the start of each energy efficiency project studied and one year following the implementation date. All data was sourced from the mill's process information (PI) historian and collated by NPPH's Alexander Allen, Financial Analyst. Once collated, the data was reviewed with Mark Frith, TMP Plant Manager. The mill's total daily electrical consumption was cross referenced with detailed monthly billing data for two months (January 2010 and January 2011) of the 4 year data set to ensure that the numbers from the data historian matched those from NSPI's power bill. As seen in figure 6, generally these two sets of data are virtually identical, but there are occasional days where there are discrepancies. It is difficult to identify the source of these discrepancies. Based on the generally good agreement between the two data sets, we have accepted the data set provided by NPPH's PI system.

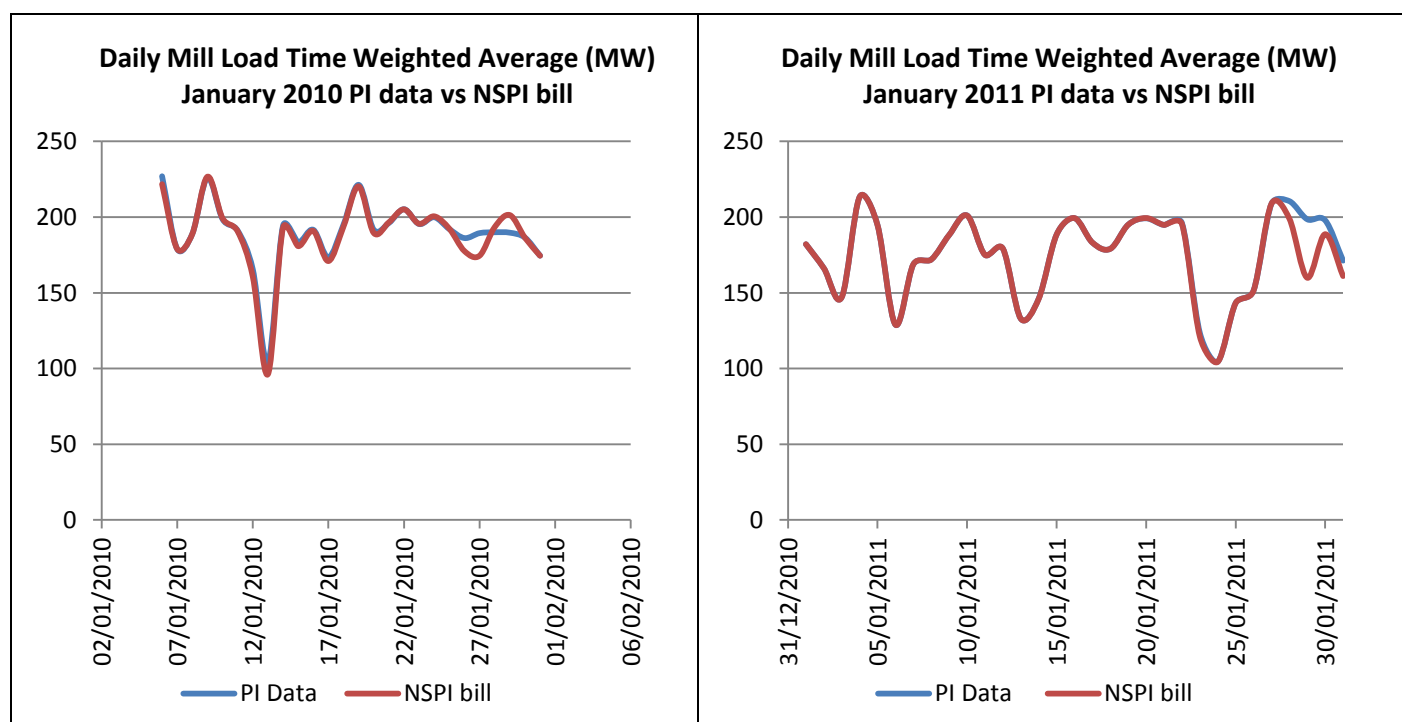


Figure 6 – Comparison of electricity consumption from NPPH PI system and NSPI Invoices

Other plant level aggregate information/data that we have used in our analysis includes:

- Daily production of paper (tonnes/d)
- TMP plant time weighted average electrical load (MW), the sum of all TMP refiner loads
- Mean outdoor temperature (°C), converted into absolute temperature (°K) for regression analyses

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Project specific data (the key process variables tracked for each project are listed below):

Line 1 Primary Refiner Replacement Project

- Daily production for each of line 1, 2 & 3 (ADMT/d)
- Time weighted average motor load for each mainline & rejects refiner motor (MW)
- Pulp freeness at each latency chest, and at TMP plant outlets to PM1 & PM2 (ml CSF)

Line 3 Optimization (freeness increase/production increase/specific energy reduction) Project

- Data from the *Line 1 Primary Refiner Replacement Project* are used for this analysis

Refined Rejects Screening (& Rejects Refining) Optimization Project

- Data from the *Line 1 Primary Refiner Replacement Project* are used for this analysis

Noss Cleaners Bypass Project

- No data was collected, as the project is not yet operational.

PM2 Vacuum Blower Power Reduction Project

- Motor load for each of the four PM2 vacuum blowers (kW)
- Net paper production (NOTE that we do not have PM2 production data prior to the implementation of this project, but combined PM1 and PM2 production data, which poses an evaluation challenge, limiting the accuracy of the savings estimate).

4.4 Period of Analysis, Energy & Conditions

Since TMP refining energy (electricity) consumption represents a full two-thirds of the NPPH mill's electric consumption a first analysis was done on TMP refining energy. Because of its relative importance as a cost driver and determinant of pulp quality, NPPH has very detailed records of refining energy for each of its refiners which make it easy to use in statistical analysis. These measurements are collected from power transmitters at each refiner. We initially requested that NPPH provide data going back to mid 2007 because we wanted to have two years of data to produce a baseline prior to the energy efficiency project implementation dates we had notionally listed as starting in mid 2009. In order to initially understand the data provided to us by NPPH, we constructed a model of this data. In this model, we derived mathematical relationships between refining energy and TMP plant production. From these relationships, we were able to construct a CUSUM chart shown in Figure 7 (next page)..

CUSUM is defined as the cumulative sum of deviations between the real data and the linear regression model. For each period of time in the data set, the value predicted by the model minus the actual value of the parameter (in our case refining energy) is calculated. The statistical analysis software calculates the standard deviation as a measure of how far away from the actual energy consumption, the value predicted by the model will typically be for a given time period (in our case one day). If the model predicts a value higher than the actual measured value for the day, the deviation value for the day will be positive. If it predicts a value lower than actual consumption, the deviation will be negative. When we sum all deviations for the full period over which the model is derived the net result should be zero. In other words, on an average basis the model is as likely to predict a value above the actual consumption as below it. Graphing the

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CUSUM function over the period gives an indication of how the energy performance changed over time.

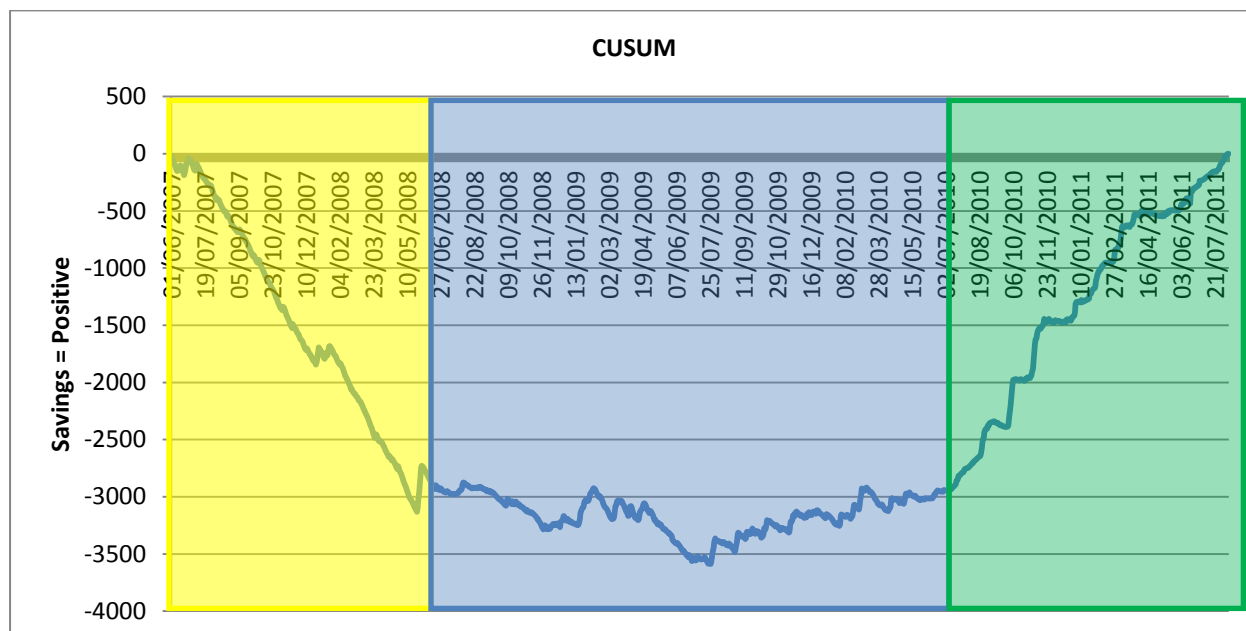


Figure 7 – Cumulative sum of deviations in the relationship between refining energy and TMP plant production at NPPH, 4+ year model

What we were able to observe as a result of having constructed the model, was that a period of sustained continuous improvement began near the mid-point of 2008. In fact, there are really 3 distinct periods that come out of this analysis, namely: (a) the initial period (yellow) prior to any improvements; (b) a period when energy efficiency operating improvements were being made resulting in a decrease in energy consumption (blue) and; (c) a period when energy efficiency projects were implemented (green).

It should be noted that a fair bit of experience is required to properly interpret CUSUM charts. In a large process facility like NPPH that is operating under steady state conditions, it is typical for CUSUM charts to be relatively flat. On the other hand if the plant is in the middle of a long term and sustained effort to improve its energy efficiency, the chart may tend to fall at first when gains are still small and reverse itself when efficiency gains are becoming increasingly significant. If the period of charting begins before the start of implementation of efficiency measures, the beginning of the chart will show a steep decline. This is because the energy performance prior to the implementation of the energy efficiency measures is worse than the average calculated by the model. The above model provides an excellent overview of different periods of relative energy efficiency performance across a multi-year period.

Nonetheless, it is more accurate to break the modelling periods into subsets, where each modeled subset matches actual conditions more closely. We have therefore adopted this approach in our analysis.

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Despite the problems with a model that does not fit actual conditions well, using the CUSUM function over a range of varying conditions can be useful in detecting patterns. In the above case, one can see three very distinct zones in the graph. The first zone, indicated in yellow shows a very steep decline in actual performance compared to the average model which fits the whole of the period, which in this case spans more than 4 years. The second zone (in blue) is relatively flat indicating that the model is pretty close to fitting the actual data. The third part of the graph shows a steep rise in performance over the last year of the period, indicating that performance is improving significantly compared to the average model that fits the whole of the period.

Now if we look at the actual TMP refining data, what we observe over this 4+ year period is that the performance was actually quite stable in the yellow period, it was improving continuously throughout the blue period, with the gains in year 3 more significant than those of year 2 and there was a very rapid improvement at the beginning of the green period that did not deteriorate over year 4. This concurs well with our knowledge of the facts about the timing of the Line 1 modernization project, which started up on June 30, 2010. It is clear that the average model for the whole of the 4+ year period does not fit either the yellow zone or the green zone very well.

4.5 Baseline Period

Based on the above analysis, we have chosen a baseline period of June 1 2007 to June 30 2008, where we have observed fairly stable operating conditions prior to energy efficiency improvements. This represents the period before improvements were made.

4.6 Reporting Period

The reporting period has been set from July 1, 2008 to August 8, 2011. This period is further broken down into two distinct sub-periods, the first being from July 1, 2008 to June 29, 2010, which corresponds to the yellow part of the CUSUM graph and the period before commissioning the Line 1 modernization project. The second sub-period for reporting is from June 30 2010, the day the Line 1 modernization started up, to August 8, 2011.

4.7 Basis for Adjustments

We have used the *standard conditions* method (SEP framework) or *normalized savings* method (IPMVP framework). The table below, which is repeated from page 11 of this report shows the standard conditions used. See section 4.4 of this report for details of how and why these conditions were chosen.

Table 4 (repeated) – Reporting periods and standard conditions for production.

Year	Period Start	Period End	Paper actual avg. Tonnes/ yr & day	TMP actual avg. ADMT/ yr & day
Yr 1	Jun 1, 2007	Jun 30, 2008	515,842 1,413.3	435,250 1,193.5
Yr 2-3	Jul 1, 2008	Jun 29, 2010	489,283 1,340.5	434,658 1,191.7
Yr 4	Jun 30, 2010	Aug 9, 2011	526,940 1,443.7	478,650 1,311.4
Standard conditions			511,000 1,400	451,797 1,237.8

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In addition to the paper and TMP production standard conditions, we also use a standard condition of 10°C when we produce total mill electrical consumption regressions (a standard condition for temperature is not required for refining energy because it is independent of temperature). We have also fixed the *Paper/TMP ratio* at 1.131 for all regressions. After much consideration, we have decided that keeping a fixed Paper/TMP ratio is the best way to ensure that we are quantifying **avoided energy use** as opposed to absolute energy savings.

The Paper/TMP ratio is simply the daily average of the net paper produced divided by the TMP produced over a given period. This parameter is very different on PM1, which uses essentially 100% TMP in the production of newsprint than it is on PM2, where significant quantities of purchased kraft pulp and various fillers such as kaolin clay are blended with TMP to produce coated papers. The average Paper/TMP ratio used in our report is a blended average of the ratios of each of the paper machines. For the first two years of data that were used, we only have the combined production of the two paper machines, while we have individual production data from each machine for the third and fourth years.

Note that we assumed a fixed Paper/TMP ratio of 0.97 in our INITIAL REPORT, and this number, while very close to being right for the newsprint machine, was clearly too low as a blended average. We have made adjustments to our INITIAL REPORT estimates now that we have a better basis for the calculation as illustrated in Table 6.

Table 6 – Adjusted INITIAL REPORT project estimates to compensate for error in INITIAL REPORT paper/TMP ratio assumption

#	Project Title	Adjusted Feb 2011 estimate		Original Feb 2011 estimate	
		GWh	MW	GWh	MW
1	Upgrade Line 1 Refiner	63.9	7.3	74.00	8.5
2	Optimize Line 3 Production	9.8	1.1	9.80	1.1
3	Optimize Rejects Screening	16.8	2.0	16.80	2.0
	TOTAL	90.5	10.4	100.6	11.6

4.8 Energy Prices

NPPH believes the electricity prices it is paying put it at a significant disadvantage compared to many of its competitors. Energy price issues have not been addressed, as this is beyond the scope of the mandate given by ENSC.

4.9 Adherence to IPMVP analysis and reporting principles

Accuracy

The electricity data reported at the whole of mill level is very accurate and has been checked against billing records from NSPI. TMP refining data is taken from motor loads and is time weighted. Paper production data is accurate because it is cross checked by mill staff against sales records. There can be significant day to day differences between net saleable paper and total

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production off the paper machines, some of which may not meet quality requirements and get reprocessed. As discussed in section 6, TMP production data may have $\pm 10\%$ error because of chip bulk density variability.

Completeness

Because we are working at the full facility level in the top-down analysis, the data we are using capture all electrical use. Because the mill is continuously producing more steam than it can use, and because any electricity generated by its turbine is directly exported to the Nova Scotia grid, it is a reasonable approach to assume that electricity consumption is not affected by steam production. Note that the opposite of this statement (that steam production is not affected by electricity consumption) is not true.

Conservativeness

Bottom-up estimates tend to be quite conservative, notably because they don't capture all the small efficiency projects that we know have been occurring at NPPH. Top-down estimates tend to be close to reality because they are based on real operating data, and they are therefore less conservative than the bottom-up estimates. We reiterate the need for the reader to be fully aware of the fact that the estimates represent avoided energy costs over time based on improving energy performance and normalized conditions. They are not necessarily a good measure of absolute energy savings.

Consistency

In each step of our analysis we have endeavoured to maintain a high level of consistency. For example, when we generate regression equations for three different time periods, we make sure all three periods are based on the same factors, even if importance factors and P-values show that a factor may not be highly significant in one of the equations, but significant in the others.

Relevance

The statistical analysis methodology allows us to quickly evaluate which factors are the most relevant, and to eliminate factors which are not relevant. A substantial amount of work goes into this part of the exercise to ensure maximum relevancy.

Transparency

EPS has worked in direct and open collaboration with NPPH in compiling all data for this report. This data is fully available in Excel format as part of the appendices of this report.

5. WHOLE OF MILL (TOP-DOWN) ELECTRICITY SAVINGS ESTIMATE

After collecting and “cleaning” the data of errors, we ran a regression analysis on total mill electrical consumption to determine what parameters or factors are statistically significant as drivers of energy consumption. The regression had an R^2 of .959, which means that the quality of the fit of the mathematical model to the actual data was very good. An R^2 of above .9 denotes a

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very good fit, R^2 between 0.6 and 0.9 is reasonably good, while an R^2 below 0.6 is very poor. The importance of factors results are presented in Table 5. The main parameters considered were:

- TMP plant production (ADMT/d)
- Total refining load time weighted average (MW) - the aggregate of all individual refiners
- Paper production (tonnes/d)
- Ambient temperature ($^{\circ}\text{C}$, converted to $^{\circ}\text{K}$)
- TMP plant outlet Freeness (ml CSF), 2 values – CSF to PM1 & CSF to PM2

Table 5 – Output from Importance of Factors Analysis

	Coefficient	Factor	Product	Percent
Intercept	-20.064	1499	-30076	-11%
Avg. refining load (MW)	1.265	180938	228846	84%
Total paper production (tonnes/d)	0.013	2077764	27123	10%
TMP plant production (ADMT/d)	-0.015	1836216	-27660	-10%
Absolute temp ($^{\circ}\text{K}$)	0.183	422141	77052	8%
L3 MCP (to PM1) CSF (ml)	0.005	150653	824	0%
MC6 (to PM2) CSF (ml)	-0.064	52851	-3401	-1%

A first conclusion from this analysis is that TMP plant outlet freeness is not a statistically significant predictor of mill energy consumption, as indicated by the very low importance percentages in table 5. In subsequent work, freeness was dropped from the analysis. Another very obvious and unsurprising conclusion is that refining load (production rate) is by far the most statistically significant predictor of mill electricity consumption.

As discussed earlier, we have used standard conditions of 1,400 t/d and 10°C for 365 days/yr. Converting this to an annual basis produces 511,000 t/of paper.

The top-down total mill electricity linear regression equations developed for the baseline period and the two reporting periods are as follows. **NPPH Total electric load (MW) =**

Yr 1 Paper Production (tonnes/d) * 0.039 + TMP production (admt/d) * 0.097 + Temp ($^{\circ}\text{K}$) * 0.068

Yr 2-3 Paper Production (tonnes/d) * 0.048 + TMP production (admt/d) * 0.090 + Temp ($^{\circ}\text{K}$) * 0.022

Yr 4 Paper Production (MT/d) * 0.049 + TMP production (admt/d) * 0.059 + Temp ($^{\circ}\text{K}$) * 0.122

The quality of the statistical fit of each model to the data is extremely good, as seen in Table 7. All three R^2 (coefficient of determination) values are above .99, meaning the model is a reliable predictor of energy consumption. In all three cases the standard deviation is less than 10% of the mill electric load at standard conditions of 1,400 tonnes/day of paper. This is still quite high variability, but indicative of the real world complexity of a pulp & paper mill.

Table 7 – Multi-variable Regression Statistical Fit Indicators and Importance Factors for NPPH's Total Electrical Consumption

Period	R^2	Standard Deviation (MW)	Importance factor / P-Value		
			Paper Production (tonnes/day)	TMP production (ADMT/d)	Temperature ($^{\circ}\text{K}$)
Yr 1	.995	13.87	29% / 4.2E-36	61% / 3.8E-57	10% / 2.0 E-4

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Yr 2-3	.991	17.00	36% / 3.7E-69	60% / 9.2E-96	4% / 5.9E-2
Yr 4	.996	16.49	39% / 2.8E-41	42% / 1.3E-34	19% / 1.5E-10

While ideally it would be desirable to have lower standard deviation numbers, we must recognize that there is always significant variability in mill energy consumption, as shown by the fact that standard deviation is in the range of 13.87-17.00 MW, which is 7-10% of the average total mill load.

The importance factor, expressed as a percentage (either positive or negative), is the relative weight that a factor has in the regression equation. Regardless of the sign, an importance factor which is less than 1% is indicative that a factor is not statistically significant. In all instances, the importance factor for the equation's variables is greater than 1%. While it is not important for the purposes of this discussion to understand the precise definition of the P-Value, it suffices to say that this value should be smaller than 0.05 to ensure that a factor is significant. In the year 2-3 equation, the P-value for ambient temperature is marginally greater than .05, thus it is questionable whether or not temperature is not a significant factor. We will keep temperature in the equation to be consistent with the baseline and Year 4 data sets.

If we derive the total mill electrical consumption estimates from these regression equations above at standard conditions of 1,400 tonnes/day of paper production and 10°C, the results are as in Table 10.

Table 8 – Top-down savings estimate, standard conditions: 1,400 t/d of paper, 10°C, 365 days/yr

#	Projects that came on-line during period (with start date)	Mill annual GWh	Avg. MW
Yr 1	Baseline	1,697.7	193.9
Yr 2-3	Optimize Line 3 (Summer 2008)* Rejects Screening (Sept 2009) PM2 Blower Reduction (28/09/2009)	1732.7	197.8
Yr 4	Upgrade Line 1 Refiner (30/06/2010)	1543.5	176.2
Total	Top-down savings estimate (Year 1 minus Year 4 Consumption)	154.2	17.8

*: Start date adjusted based on data evidence & verification with mill

When plotted graphically for a range of production rates, the results appear as in Figure 8. It is interesting to note that the total mill energy performance for the Year 2-3 period is slightly poorer than for the baseline period (Year 1), even though (as seen earlier) the TMP plant's performance was better in the year 2-3 period than during the baseline period. Several factors could explain this, but because of gaps in the data, there is no way of knowing definitively.

Despite the above observation, in the year 4 period after the line 1 modernization project, total energy savings are very significant. It is worth noting that the performance figures are based on the actual data collected from the mill and that the methodology is designed to correct for a host of factors that can vary through time, such as production rates, ambient temperature, etc.

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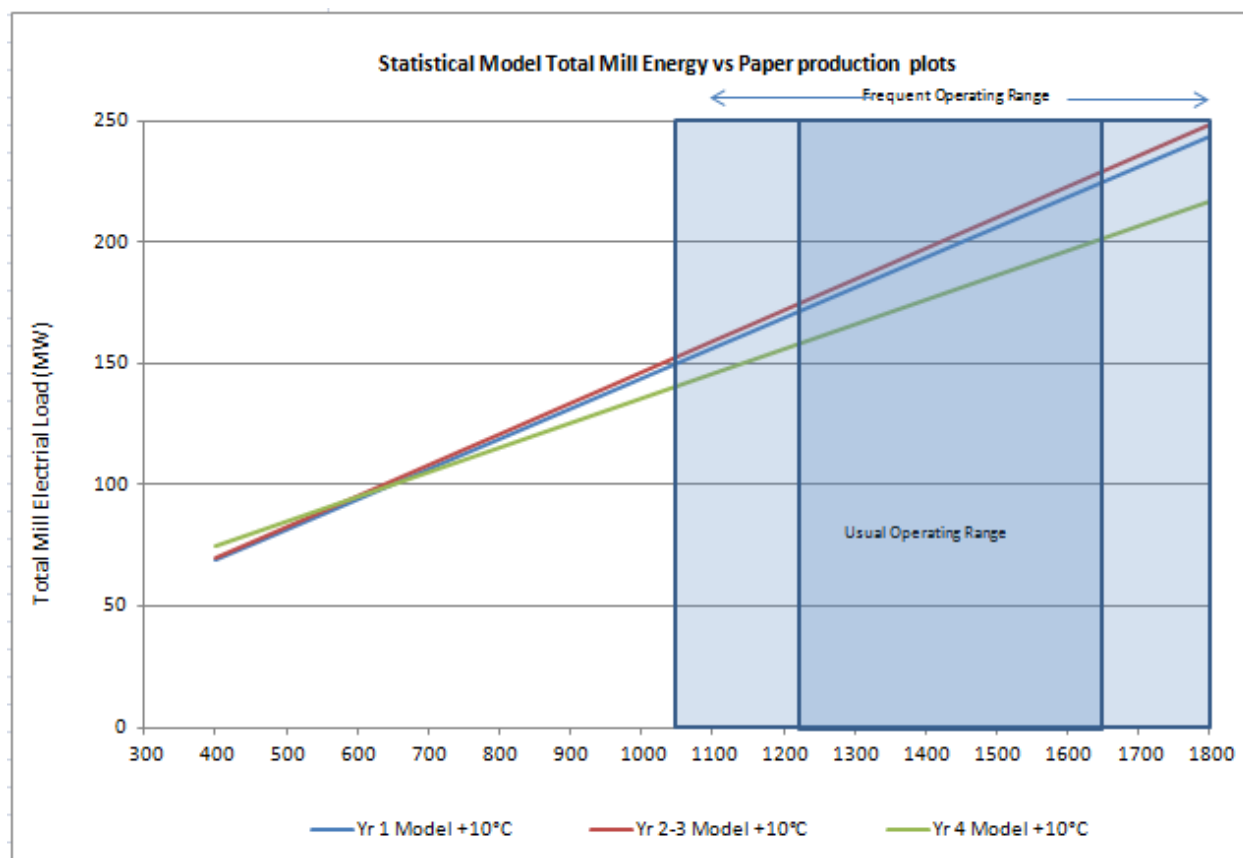


Figure 8– Statistical model for top-down total mill electricity consumption as a function of paper production at 10°C

6. ANALYSIS OF PROJECT RESULTS

One of the key requirements of the SEP M&V protocol is that top-down energy performance for facilities be calculated and then “sanity-checked” against aggregated bottom-up calculations of individual Energy Conservation Measures. This section reviews each of the main energy efficiency projects for this “bottom-up” sanity check.

6.1 TMP plant projects

As discussed earlier, the refiners in the TMP plant represent two thirds of the NPPH mill’s total electrical consumption. For all three projects with measurable results, we looked exclusively at the changes to refiner electricity consumption, which tend to dwarf smaller changes at the process auxiliary equipment level. For example a new screw press with a 150 kW motor is almost impossible to pick up statistically at the mill aggregate level which is in the order of 175 MW, but the refining energy changes which result from its installation and which could be in the range from 0.5-5.0 MW would be very easy to identify in the statistical analysis.

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Because projects 2 & 3 were done concurrently and the energy data available is for the whole of the TMP plant, it is impossible to disaggregate the savings into distinct projects when doing the statistical analysis. The reported start date for project 2 is notional. In fact, this was part of a long term effort to increase final pulp freeness, run refiners at high throughput because of known energy efficiency benefits, etc. that began much earlier than mid 2009. Statistical analysis shows that there were definite & sustained incremental improvements starting in mid 2008.

Based on this definitive trend in the data, we moved the beginning of the reporting period to July 1, 2008. It should be noted that the INITIAL REPORT made no attempt to set a baseline date. It just looked at project-specific savings and was based on observed changes that were self-reported by NPPH.

Once we had selected the baseline and two reporting periods, we then ran a series of regression analyses on TMP refining energy. This work showed that weather conditions (as represented by ambient outdoor temperature) do not affect refining energy in a statistically significant way. We have therefore only reported TMP project results that did not factor in temperature in the analysis. Table 9 shows a summary of the quality of the regression fit to the data for each period with the first series factoring in temperature, and the second series removing temperature from the analysis.

Table 9 - Summary of key statistical factors, TMP energy regressions

Series	Period	R ²	Standard Deviation (MW)	Importance factor / P-value			
				Intercept	Paper production	TMP Production	Temp (°K)
With Temp	Yr 1	.745	11.4	-7%/.664	28%/9E-25	83%/1E-68	-5%/.755
	Yr 2-3	.839	11.9	-2%/.850	31%/3E-48	83%/2E-135	-11%/.363
	Yr 4	.705	12.3	23%/.154	35%/1E-29	63%/5E-53	-21%/.193
Without Temp	Yr 1	.745	11.4	-11%/9.8E-04	28%/2E-25	83%/9E-96	N/A
	Yr 2-3	.839	11.9	-13%/1.8E-11	31%/1E-48	83%/2E-138	
	Yr 4	.705	12.3	-2%/.447	35%/2E-29	63%/9E-53	

Table 9 clearly shows that removing temperature from the regression analysis has no effect on the quality of the mathematical fit to the data as shown by the fact that the R² (the coefficient of determination) and standard deviation are completely unaffected when we remove temperature from the equation. While ideally it would be desirable to have higher R² and lower standard deviation numbers, we must recognize that there is always significant variability in refining energy, as shown by the fact that standard deviation is in the range of 11.4-12.3 MW, or approximately 10% of the average refining load.

The importance factor, expressed as a percentage (either positive or negative), is the relative weight that a factor has in the regression equation. Regardless of the sign, an importance factor which is less than 1% is indicative that a factor is not statistically significant. In all instances, the importance factor for the equation's variables is greater than 1%. While it is not important for the purposes of this discussion to understand the precise definition of the P-Value, it suffices to say that this value should be smaller than 0.05 to ensure that a factor is significant. In the first series of equations, the P-value for ambient temperature is greater than .05, thus temperature is not a

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significant factor. In the case of the Year 4 intercept, the P-value is greater than .05, but we will keep intercept in the equation to be consistent with the baseline and Year 2-3 data sets.

One interesting observation is that the refining energy variability actually increased in the Year 4 reporting period. There are several reasons for this. One of these is that each of the three main refining lines now has very different specific energy consumption. The bigger the capacity of the line and the higher its throughput, the more efficiently it operates. Despite the compromises required, it is therefore more efficient to run TMP lines as hard as possible and shut them down when they are not required than to reduce production over a longer period to meet a specified paper machine requirement.

Coupled with the observation that the importance factor for paper production has increased in the Year 4 period, this is indicative of the fact that the mill now has more flexibility to vary its production levels in response to variations of paper machine production because of the increase of TMP plant capacity provided by the Line 1 modernization project. It also means that the plant can better take advantage of load shedding opportunities when power prices are high. It is now also in a much better position to actively manage its electric demand than it was prior to the project.

The TMP refining energy linear regression equations developed for the baseline period and the two reporting periods are as follows. **TMP refining load (MW) =**

Yr 1	-14.281 + Paper production (tonnes/d) * 0.025 + TMP production (admt/d) * 0.088
Yr 2-3	-15.47 + Paper production (tonnes/d) * 0.027 + TMP production (admt/d) * 0.081
Yr 4	2.973 + Paper production (tonnes/d) * 0.030 + TMP production (admt/d) * 0.058

The first term of each equation is the Y-axis intercept, the second and third terms are the terms proportional to Paper and TMP production respectively. The multipliers in each of these terms are called the paper production and TMP production coefficients. Figure 7 illustrates what most typical linear regressions look like. The Y-Axis intercept may be interpreted as approximately equivalent to a facility's fixed load. This is the load which would be required to run the facility at zero production. Things like lighting and other services typically are part of this base load.

Unlike figure 9, the Year 1 and Year 2-3 functions have negative Y-axis intercepts. This is partly due to inherent limitations of using linear regression as opposed to second or third order regressions. A linear regression forces the model to produce a function which is a straight line when plotted on a graph. We have already seen that the TMP plant is less efficient at low throughput than at high production levels so a straight line does not accurately represent the relationship between power and production. The line which is calculated by the model may actually intercept the negative part of the Y-axis. If the plant runs more often at decreased throughput, it is more likely that the intercept part of the equation will be negative. Despite the Year 4 model's low R² value, it probably does a better job of representing reality than the models for the other two periods because of this non-linearity. It is important to recognize that all of the models are imperfect attempts at fitting highly complex data to a relatively simplistic straight line.

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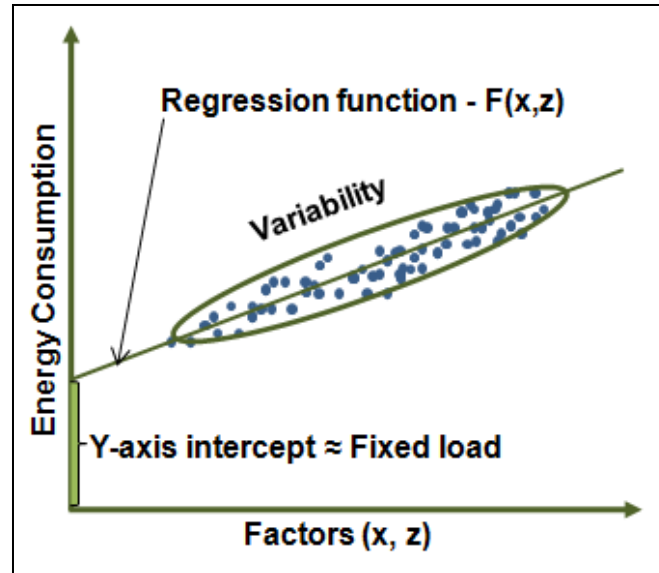


Figure 9 – Energy Regression Function

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Figure 10 shows the residual or scatter plots of actual data vs. linear regression model functions for the baseline period (Year 1) and the two reporting periods (Year 2-3 and Year 4). While these graphs show significant process variability, they do show the regression function reasonably approximates the actual real world situation.

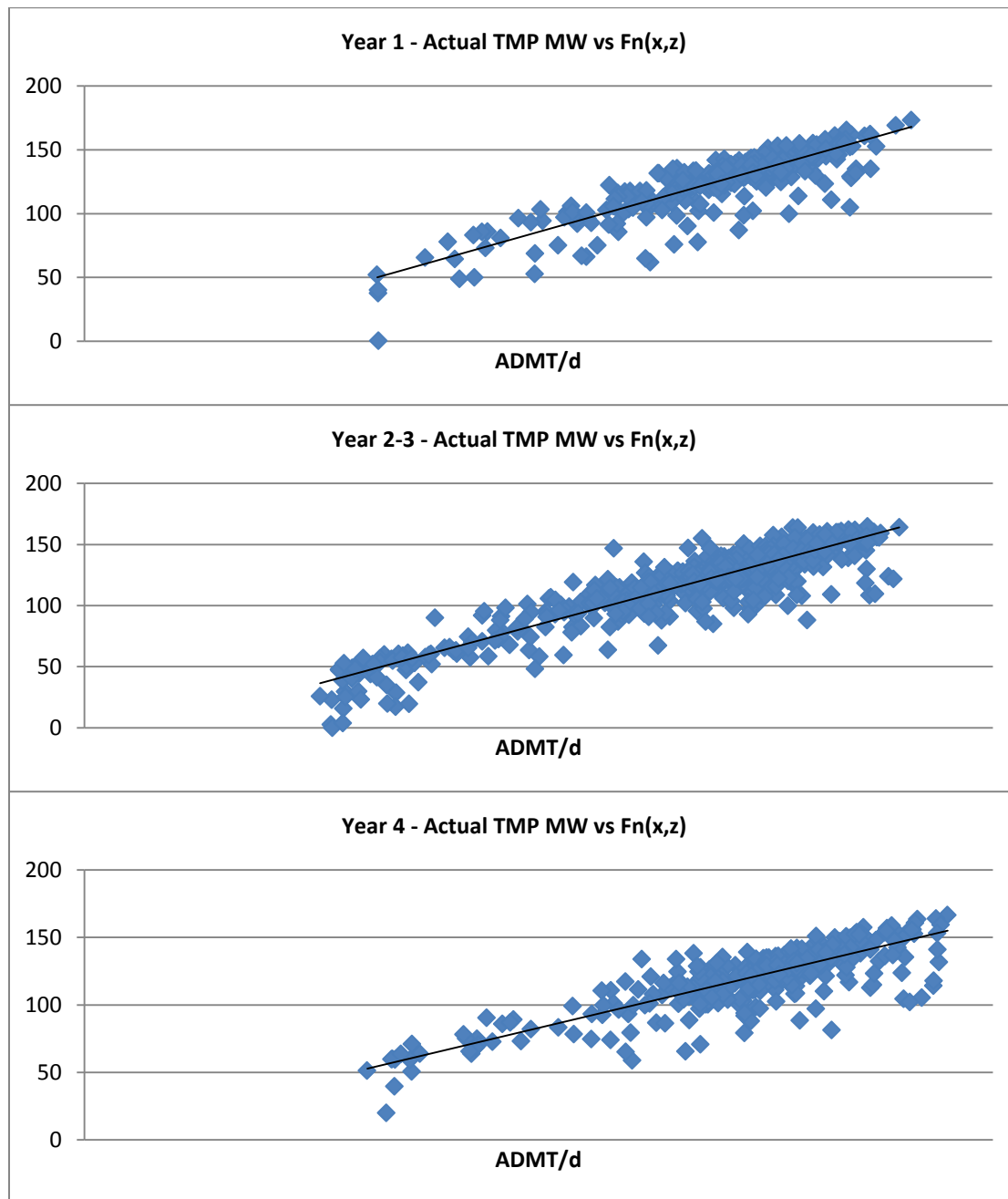


Figure 10 – Scatter plots of actual data vs linear regression model baselines, 3 reporting periods

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Figure 11 shows the actual reported values vs. those predicted by the model for Year 4, as well as the control chart with a band between +1 and -1 standard deviations. In both cases the Y axis values are in TMP refining MW. The top chart shows that there is good agreement between the data and the model. The bottom chart shows that the model more often overestimates consumption than underestimates it. This is a sign that mill operations staff were doing a good job managing their energy performance over the Year 4 reporting period.

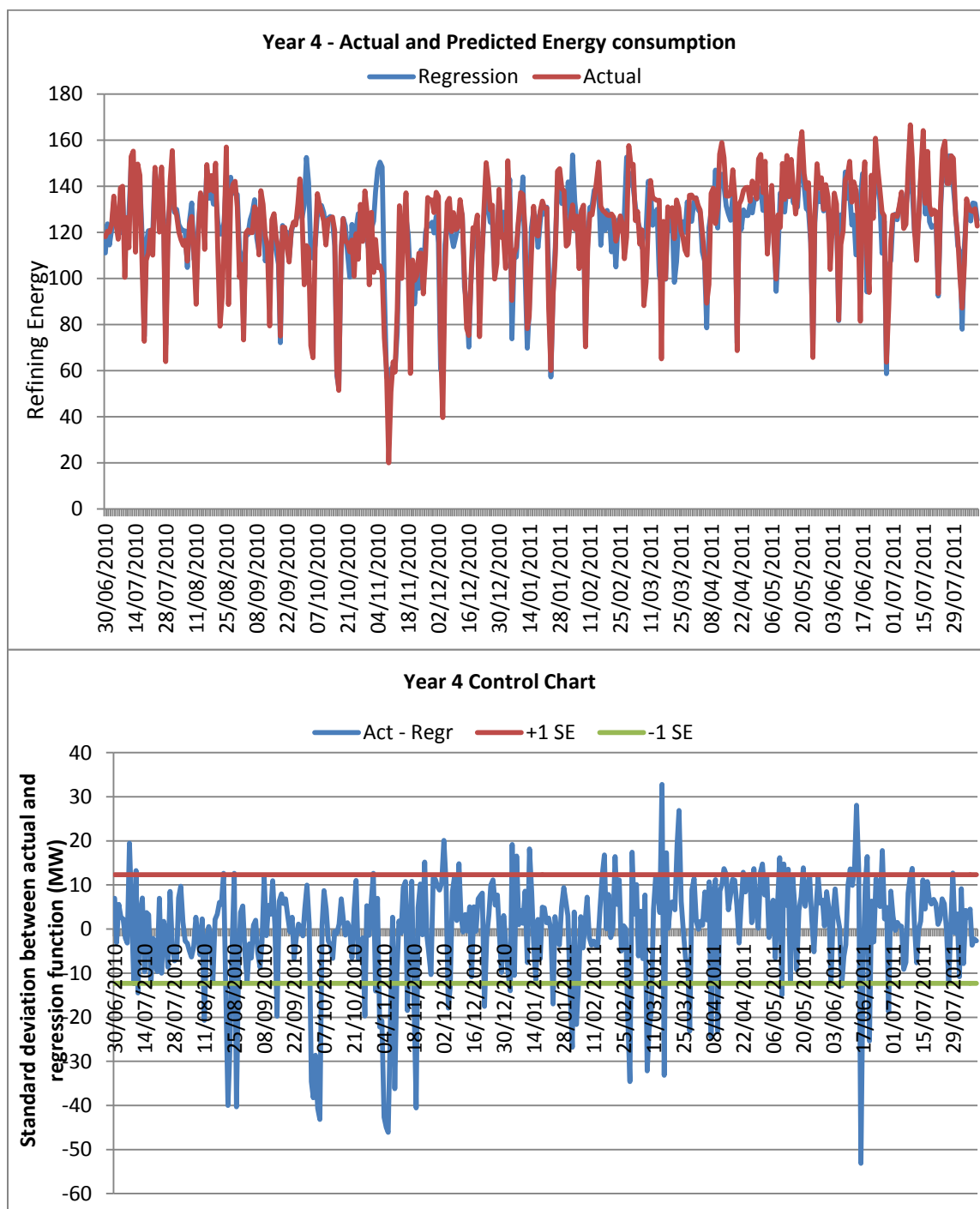


Figure 11 - Actual data values vs those predicted by the model (top), Control chart with a band between +1 and -1 standard deviations (bottom) – Year 4 period

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Now that we have shown a number of examples of the charts that are obtainable using the regression analysis software, we can plot in Figure 12 the graph with the linear regression functions for the baseline period (Year 1) and the two reporting periods (Year 2-3 and Year 4). For the sake of completeness, we have also included a plot of the model which spans the full 4+ year data set. The blue boxes on the right side of Figure 12 show the usual operating range where the TMP plant operates most of the time designated by the darker blue area, as well as the frequent operating range, which covers an even wider set of conditions. The TMP plant operates at the two extremities of this range less often than it does in the usual operating range, but it is not unusual to be running under these conditions. Anything out of these ranges would be rather uncommon operating conditions.

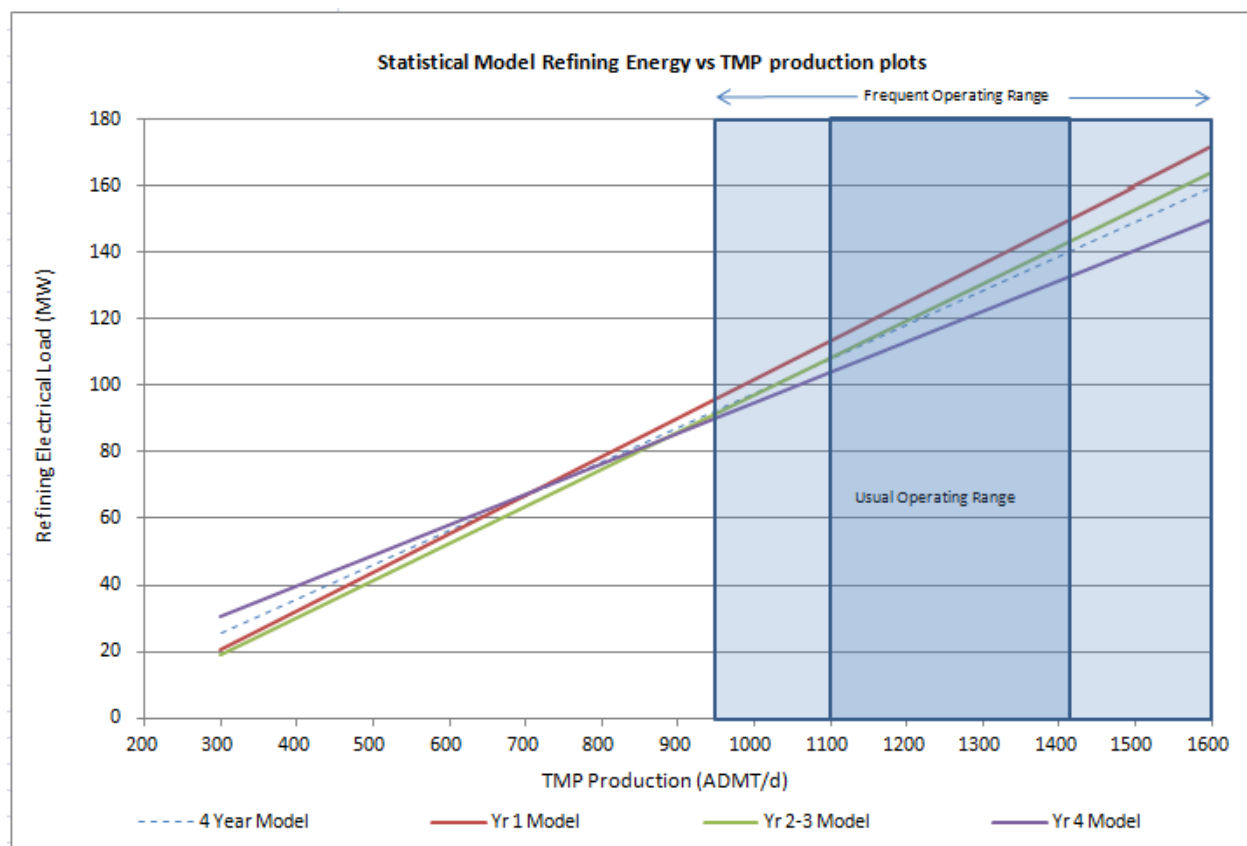


Figure 12 – Graphical representation of the statistical models
TMP plant refining energy vs production – at a fixed Paper/TMP ratio of 1.131

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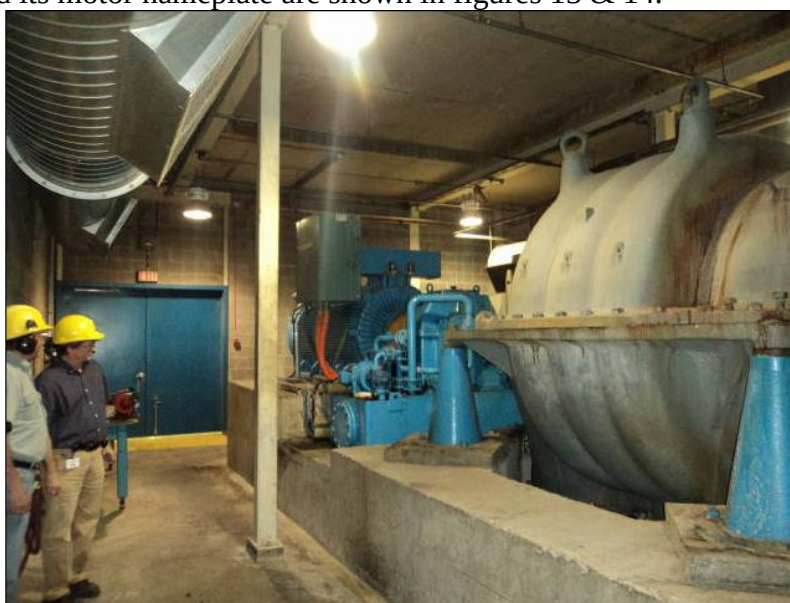
Table 10- Bottom-up savings estimate, standard conditions: 1,237.8 ADMT/d of TMP, 365 days/yr fixed Paper/TMP ratio of 1.131

#	Project Title	Year started	Bottom-up savings estimate at fixed Paper/TMP ratio	
			GWh/yr	MW
1	Upgrade Line 1 Refiner*	2010	53.4	6.1
2	Optimize Line 3 Production**	Mid 2009	59.6	6.8
3	Optimize Rejects Screening**	Sep 09- Jun 11		
	TOTAL		115.6	12.9

It is important to note that while paper net production estimates are quite accurate because paper is the mill's final product, pulp production estimates tend to be much more prone to error. The reason for this is that the TMP production estimates are derived from primary refiner feed screw speed conversions ($ADMT/RPM$ or $air\ dry\ metric\ tons\ per\ revolution\ per\ minute = ADMT/min * 60\ min/h * 60\ h/day = ADMT/d$). These are notoriously difficult to calibrate because chip bulk density can vary by about $\pm 10\%$ and there is no reliable and inexpensive way to track bulk density variations.

6.2PM2 Vacuum Blower Power Reduction Project

According to the INITIAL REPORT, one of 4 blowers was shut down on PM2 vacuum system in the fall of 2010 and significant changes were made to the suction system. In fact this project took place earlier. Though PM2 occasionally ran with 3 blowers when short term blower maintenance was required prior to the project, it was only once the project was completed that the mill went to a sustainable 3-blower operation. This took place on July 28, 2009. The mill continues to have all 4 blowers available but most of the time, only three of them are in operation. Photos of the #3 vacuum pump and its motor nameplate are shown in figures 13 & 14.



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Figure 13 – PM2 Vacuum pump #3. Of 4 pumps available, only 3 are now required at a time

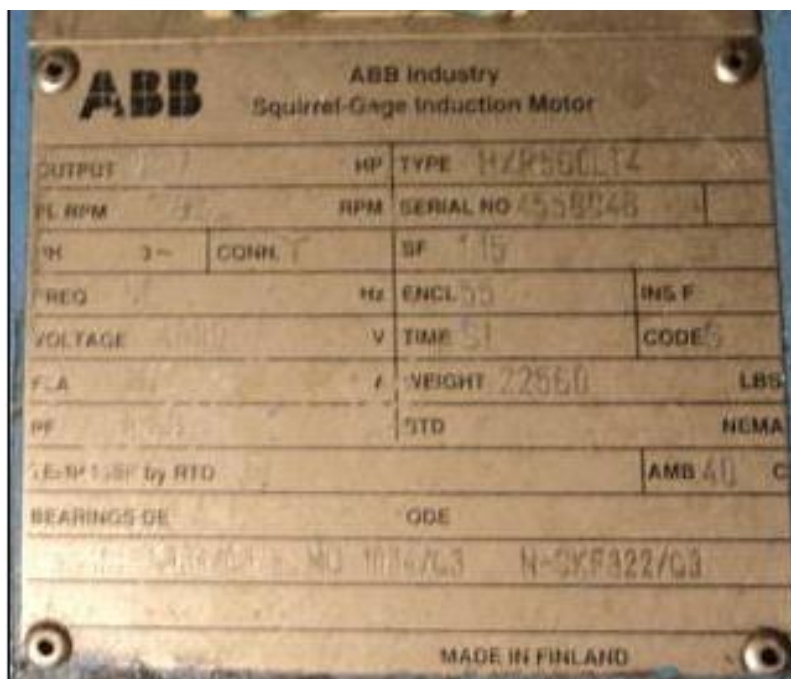


Figure 14 – PM2 Vacuum pump #3 motor nameplate (Rated at 2007 HP/ 1497 kW)

Table 11- Regression equations for combined load of 4 PM2 Blowers
Standard Conditions, 1400 tonnes/day, 365 days/year

Period	Electrical load (kW) =	Load at 1,400 tonnes/d (kW)	Savings	
			GWh	MW
Yr 1	Paper Production (tonnes/d) * 3.362	4,707		
Yr 2-3	Not calculated (variable conditions)			
Yr 4	Paper Production (tonnes/d) * 2.625	3,675	9.04	1.03

Though it would be useful to have aggregate electrical consumption data for the PM2 plant in isolation, unfortunately this is not available. Despite this constraint, we were able to derive linear regression equations from the daily time weighted averages for PM2 blower power consumption. Table 9 shows these equations and the blower load at 1,400 tonnes/day of mill paper production (PM1 & PM2). Unfortunately we were not able to obtain PM2 production data for the baseline period, so we were constrained to using the combined data from both paper machines. Regardless of these data limitations, these equations provide a reasonable basis for a savings estimate.

A number of claims have been made about secondary energy efficiency benefits due to the PM2 vacuum blower power reduction project, such as reduced PM 2 drive loads. Unfortunately there is no way of verifying these claims at the project level because the mill does not have the metering data to verify these claims. In future, this metering equipment could be added if it is deemed useful.

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7. AGGREGATED PROJECT RESULTS

Finally, as per the suggested procedure within the SEP M&V protocol, we have tallied all the bottom-up energy saving estimates in order to compare them to the top-down estimate derived from the mill aggregated consumption data. Table 10 summarizes the bottom-up calculations. It should be noted that project 4 does not contribute to the savings that can be validated by statistical analysis, as it has not yet been commissioned. We have therefore done totals with this project included, as well as without it.

Table 11 – Comparison of results of bottom-up statistical analysis to adjusted INITIAL REPORT estimates, standard conditions basis, 1,250 ADMT/d for TMP, 1400 tonnes/yr and 10°C for PM2 project, 365 days/yr

#	Project Title	Year started	Bottom Up estimate based on statistical energy analysis		Adjusted INITIAL REPORT estimate	
			GWh	MW	GWh	MW
1	Upgrade Line 1 Refiner*	2010	53.4	6.1	63.9	7.3
2	Optimize Line 3 Production**	Mid 2009	59.6	6.8	9.8	1.1
3	Optimize Rejects Screening**	Sep 09-Jun 11			16.8	2.0
4	Bypass Noss Cleaners (Not completed)***	Feb-Sep 2011	N/A	N/A	11.30	1.35
5	PM2 Vacuum Blower Power Reduction	Late 2009	9.04	1.03	12.60	1.5
	TOTAL (incl. project 4)		122.0	13.9	114.4	13.25
	TOTAL (excl. project 4)		122.0	13.9	103.1	11.90

* Line 1 refiner upgrade savings reported in bottom-up estimate consolidates and reinforces the savings from projects 2 & 3.

** Because projects 2 & 3 were done concurrently and energy data is for the whole of the TMP plant, it is impossible to disaggregate the savings into distinct projects when doing the statistical analysis.

*** Though NPPH had done much work on this project prior to the September 2011 shutdown, it was not yet operational, and therefore the Feb 2011 estimate is only valid in that it shows potential savings, not actual ones.

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8. CONCLUSIONS & RECOMMENDATIONS

The top-down electricity savings estimate for the whole mill described in Section-5 of this Report is consistent with the M&V requirements defined in the SEP M&V Protocol and meets all the IPMVP criteria (*accuracy, completeness, conservativeness, consistency, relevance and transparency*) and therefore it can be considered to be an excellent representation of the true electrical energy performance of the NPPH mill in the Year 4 reporting period (June 30, 2010 to August 8, 2011). It also comes fairly close to the adjusted INITIAL REPORT estimate, which is an indication that the numbers reported at the time were a reasonable representation of NPPH's actual energy performance but were likely highly conservative as a result of a lack of supporting information. It is also reasonable to expect that the top-down analysis figures are higher than the bottom-up numbers due to the fact that the availability of data to support the bottom-up analysis is limited and hence we may not be capturing all of the savings achieved by those energy efficiency projects. We believe that the Top Down estimate is a reasonable representation of the actual energy savings achieved by this facility.

#	Project Title	Year started	Adjusted INITIAL REPORT estimate		Bottom Up estimate based on statistical energy analysis		Top Down Estimate	
			GWh	MW	GWh	MW	GWh	MW
1	Upgrade Line 1 Refiner*	2010	63.9	7.3	53.4	6.1		
2	Optimize Line 3 Production**	Mid 2008	9.8	1.1	59.6	6.8		
3	Optimize Rejects Screening**	Sep 09-Jun 11	16.8	2.0				
4	Bypass Noss Cleaners (Not completed)***	Feb-Sep 2011	11.30	1.35	N/A	N/A		
5	PM2 Vacuum Blower Power Reduction	Late 2009	12.60	1.5	9.04	1.03		
	TOTAL (incl. project 4)		114.4	13.25				
	TOTAL (excl. project 4)		103.1	11.9	122.0	13.9	154.2	17.8

In NPPH's case, electricity consumption is essentially independent of the thermal balance of the mill because of a large and continuous venting of steam to atmosphere. It is therefore very reasonable to apply the methodology as we have done to the electrical portion of the mill's energy supply, without being required to factor in the steam balance. In the future, however, it may be useful to consider the steam balance and its effect on exported electricity. The mill's thermal energy balance is very directly affected by the use of electricity, since most of the refiner electric load is converted into steam within the refiners. In fact, up until the current mill shutdown, the mill has been venting 35-50% (≈ 8.0 - 11.4 kg/s) of TMP steam to atmosphere as waste heat. For the sake of completeness, we would recommend factoring steam into future energy analyses.

GREEN HEATING SYSTEMS INITIATIVE

OVERVIEW FOR ENSC'S 2013-2015 DSM PLAN

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Submitted to:
EFFICIENCY NOVA SCOTIA CORPORATION

January 31th, 2012



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THE GREEN HEATING OPPORTUNITY

BACKGROUND

In its 2012 DSM Plan filing, ENSC filed an Electricity Demand Side Management Review. Prepared by Dunskey Energy Consulting, the report reviewed ENSC's portfolio of programs, and made a number of recommendations aimed at maximizing ENSC's ability to help Nova Scotians achieve cost-effective electricity savings. While the report addressed some regulatory changes, it was focused on a full review of programs and, as such, made a series of recommendations including changes to existing programs, and the addition of new strategies.

The report notably recommended six new strategies, including implementation of a "Renewable Heating Industry Strategy" that was deemed to offer the opportunity for "very significant" long-term savings.

OBJECTIVES

Green Heating Systems, which we have defined to include systems that deliver all or most of their heat directly from renewable resources, have the potential to deliver significant benefits to Nova Scotia, including electricity savings, greenhouse gas emissions reductions, and positive economic benefits.

Although ENSC currently operates programs (EnerGuide for Houses, Performance Plus for new homes) that address Green Heating Systems, these programs are aimed at more comprehensive improvements and as a result, cannot capture all opportunities. For example, homeowners with serious air leakage or insulation problems may turn to the EnerGuide for Houses program, but those whose homes are adequately weatherized and only need to change their heating system at the end of its useful life are unlikely to do so. Nor will homeowners with no serious comfort issues and who heat with electric baseboard pay for, and take the time to go through, a program that involves full-scale home energy audits. The Green Heating Systems initiative is therefore aimed at creating new channels for addressing opportunities that are unlikely to go through the existing programs.

With the adoption of a Green Heating Systems initiative, ENSC will support the development of a diverse, stable, and sustainable heating market with a flexible delivery infrastructure. It will notably work on both "push" and "pull" strategies, including through the offer of incentives (and potentially financing), as well as through training, marketing, relationship building and other added value offered to HVAC installers, contractors and builders. Green Heating systems are expected to be promoted as part of a seamless, all-fuels approach; however this report addresses only the costs and benefits that would accrue from electricity savings; the other components will be paid for through non-DSM funds.

TARGET HEATING SYSTEM TECHNOLOGIES

Green Heating Systems are defined as those that produce all or a substantial share of their heat from renewable energy, including the sun (e.g. solar thermal), heat in the air (premium air-source heat pumps, including ducted and ductless models), the ground or groundwater (ground source heat pumps), or biomass (wood or pellet stoves, furnaces and boilers). Table 1 presents the renewable source for each of the heating systems included in this initiative, as well as the approximate portion of the delivered heating energy which comes from that renewable source.

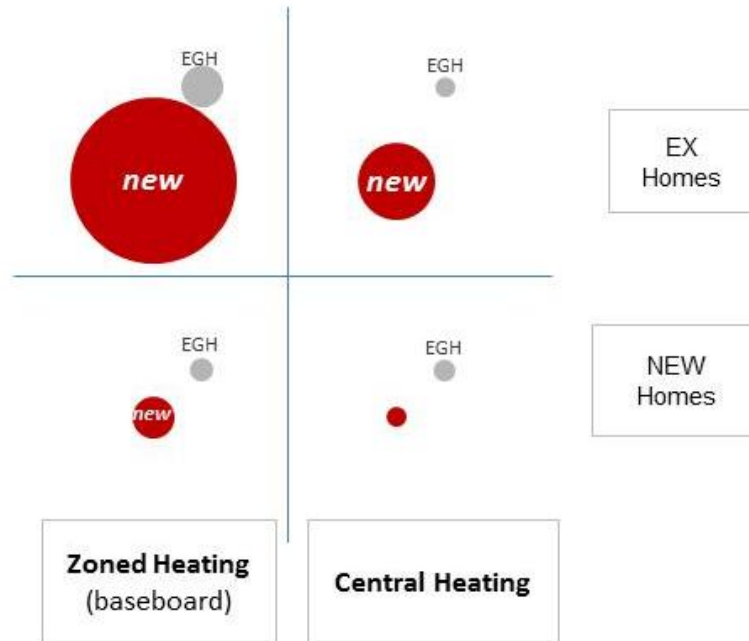
1 - Green Heating Systems

Heating System	Renewable Source	Renewable Heat	Loads served
Solar Thermal	Sun	100%	Part
Ground Source Heat Pumps (GSHP)	Earth	~75%	Full
Ductless Air Source Heat Pumps (DHP)	Air	~60%	Part
Air Source Heat Pumps (ASHP)	Air	~60%	Full
Pellets	Biomass	100%	Part or Full
Cordwood	Biomass	100%	Part or Full

TARGET MARKETS

The different green heating systems promoted through this initiative will target different markets. The following chart presents the relative proportions of electrically heated homes in the province, segmented by their participation or non-participation in one of ENSC's comprehensive programs, and further distinguished by the type of heat distribution system used in their home. Note that "EGH" refers to the current EnerGuide for Houses program, while "PP" refers to the current Performance Plus program for new homes.

1- Electric Space Heating Households - by channel and heat distribution systems



As can be seen, the vast majority of Nova Scotia's electrically heated homes are not being reached by the existing comprehensive energy efficiency programs, and a significant portion of those use a zoned (baseboard) heating system. Table 2 presents our qualitative assessment of the market potential for each technology based on the type of heat distribution system.

2 - Green Heating Systems Market Potential

Target Technologies	Zoned Heating (baseboard)	Central Heating (furnaces, boilers)
Solar Thermal	Small	Small
Ground Source Heat Pumps (GSHP)	<i>marginal</i>	Small
Ductless Air Source Heat Pumps (DHP)	LARGE	<i>marginal</i>
Air Source Heat Pumps (ASHP)	<i>marginal</i>	Small
Pellets / Cordwood Stoves	Medium	Medium
Pellets / Cordwood Furnace/Boiler	<i>marginal</i>	Small

Although most of the technologies (except for DHPs) individually represent only a small market potential, the combination of the proposed technologies represents a considerable potential for both electricity and GHG savings.

PERFORMANCE CRITERIA

The Green Heating Systems initiative will strive to promote only the most efficient systems within each technology area. To do so, it will adopt, where feasible, specific performance requirements based on independent, third-party criteria. Where such criteria may not exist or may not be appropriate for Nova Scotia, ENSC will work with industry, government and others to develop appropriate standards or adapt standards used by other DSM program administrators. Table 3 outlines the existing requirements and the requirements to be developed for each proposed system.

3 - Green Heating Systems Requirements

Technologies	Existing Requirements for Eligibility	Requirements to be Developed
Solar Thermal	None	TBD
Ground Source Heat Pumps (GHP)	Conforms to CAN/CSA-448. Installation certified by CGC.*	
Ductless Air Source Heat Pumps (DHP)	None	TBD; high-performance std. under dev't in Pacific NW.
Air Source Heat Pumps (ASHP)	None	TBD; high-performance std. under dev't in Pacific NW.
Pellets / Cordwood Stoves	CSA-B415.1-10, or US EPA 40CFR Part 60 AAA	
Pellets / Cordwood Furnace/Boiler	CSA-B415.1-10, or US EPA 40CFR Part 60 AAA	

* *Canadian GeoExchange Coalition.*

Eligible systems and requirements will be revised as appropriate based on market conditions, technology development, evaluation and verification results, and implementation experience.

ENSC will develop or adapt specific requirements for air source heat pumps, targeting systems which provide higher performance levels. This work, to be initiated in 2012 and likely pursued through 2013, will involve collaboration with other leading DSM program administrators that are currently investigating options for delineating premium efficiency systems.

ENSC recognizes that the performance of *ducted* air-based central heating systems is sensitive to the quality of the distribution system itself, and will investigate approaches to address duct leakage. However, this is unlikely to materially impact electricity savings, for which ductless heat pump models are more appropriate in the vast majority of cases.

OTHER CONSIDERATIONS

While most of the targeted Green Heating Systems are readily available in Nova Scotia, this is not the case of whole-house, fully-automated pellet boilers and furnaces. In keeping with the recommendations of our previous report on fuel switching, this initiative would include an initial pilot project aimed simultaneously at funding demonstration projects using whole-house systems, and at encouraging development of a third-party pellet supply distribution service.

In addition to the promotion of Green Heating Systems, this initiative will provide considerable opportunities to increase awareness of other related electricity and energy savings opportunities. These include encouraging regular maintenance of heating systems, as well as the importance of increasing home envelope performance through weatherization, and the value of a comprehensive whole-house approach. To this end, program incentives will be designed to encourage participation in ENSC's existing whole-house program channels, without requiring it.

KEY PERFORMANCE ASSUMPTIONS

Our assessment of the likely costs, benefits and electricity savings associated with this program is built upon hundreds of important inputs that address such issues as incremental costs, savings, baseline technologies, free ridership, market penetration and others. Among these, assumptions around the energy performance of heat pumps are particularly important.

The program's intent is to support increased market penetration of the most efficient systems from the categories presented. These systems include categories for which ENSC will develop performance criteria. Of specific interest are air source heat pumps, both ducted and ductless systems, which already have a strong market presence. However, the energy performance of those systems can vary considerably, and there is a substantial opportunity for moving the market toward higher-performance, premium systems.

As a result, for ducted air source heat pumps, we base the performance assumptions on the Energy Trust of Oregon definition of premium efficiency heat pumps, requiring a Heating Seasonal Performance Factor (HSPF) of 9.0 for region IV. This is equivalent to an HSPF of 7.8 for region V.¹

For ductless heat pumps, we assume an HSPF of 8.7 for region V, representative of the best performing systems available in the market. There is work currently underway in the Pacific Northwest to define requirements for high performance ductless heat pumps, and ENSC will closely monitor this effort and evaluate its appropriateness for Nova Scotia.

While providing a significant reduction in heating energy consumption, some of the systems proposed also provide the opportunity for participants to add conditioned air to their homes. Our assessment includes a provision for electricity saving penalties arising from this inadvertent load building.

¹ The current Energy Star HSPF requirements for air-source heat pumps is 7.1 in Canada.

KEY COMPONENTS

CHANNELS

The Green Heating Systems initiative will focus primarily on existing HVAC channels, as well as on direct marketing to homes heated with electric baseboard, to promote Green Heating Systems. In order to add additional value, the initiative will also encourage participation in ENSC's EnerGuide for Houses and Performance Plus program wherever appropriate, including through the provision of higher incentives.

INCENTIVES

The initiative provides financial incentives for selected technologies, and also assumes the provision of some form of financing (developed through the Innovative Financing Enabling Strategy). The program administrator may choose to channel some of the incentive budget to buy down interest rates on the financing offer. This will only be appropriate for certain technologies (e.g. ground source heat pumps, solar thermal and automated whole-house pellet systems).

MARKETING

ENSC will conduct marketing and outreach activities to increase awareness and confidence in Green Heating Systems. Marketing strategies would outline the key green heat systems being offered, their characteristics, as well as the factors to consider when selecting a system for specific applications. Case studies of the different systems could be made available highlighting the various benefits of green heating systems. Marketing materials will always encourage customers to take a comprehensive view of their home's energy performance.

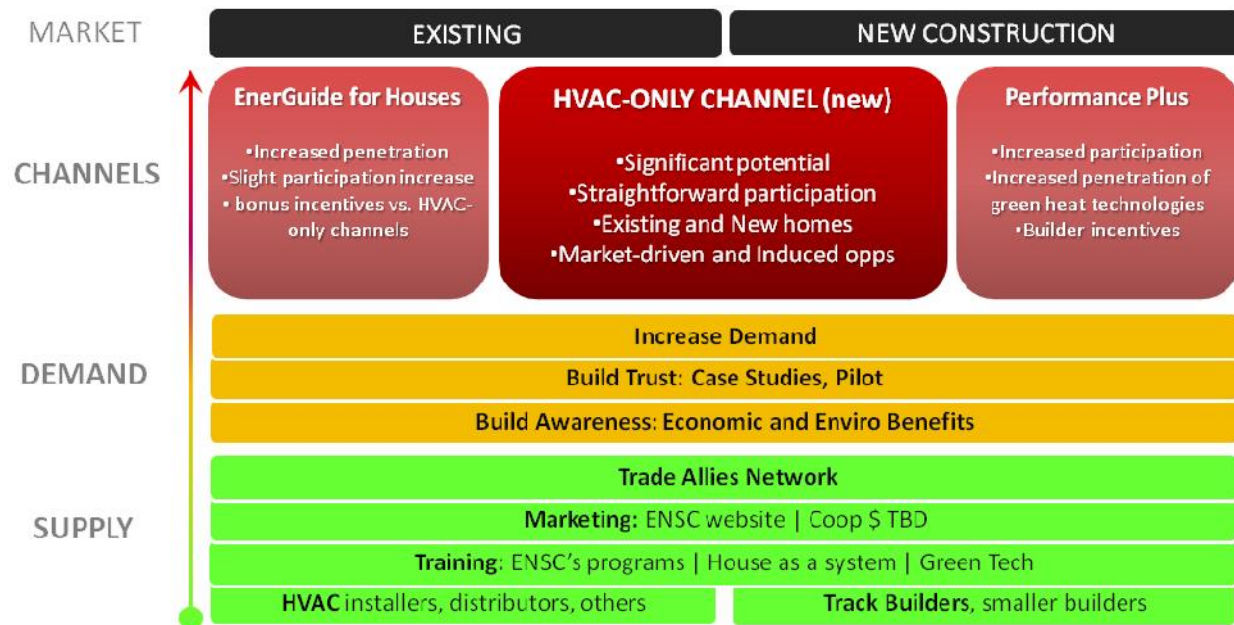
INFRASTRUCTURE

ENSC will leverage the Trade Ally Network developed through its Capacity Building Enabling Strategy to increase the supply and installation quality of Green Heating Systems. This will be achieved by providing specific training on advanced heating systems, increased visibility for Trade Ally Network members through ENSC's website, and potentially targeted cooperative marketing opportunities for members that demonstrate a strong commitment to green heating systems. Recognizing the role of builders in the selection of heating systems in the new construction market, ENSC will consider offering upstream financial incentives to builders dedicated to Green Heating Systems or for increased installation of selected technologies.

Increased penetration of automated whole-house pellet systems relies heavily on the successful creation of a pellet delivery infrastructure. There is currently no bulk pellet delivery service for the residential market in Nova Scotia. ENSC will endeavor to support the establishment of a delivery infrastructure, possibly through a pilot project that would simultaneously support demonstration of fully automated whole-house pellet systems.

BIRD'S EYE VIEW

The chart below illustrates the strategy and its key components.



This approach is meant as a guide rather than a prescriptive recipe. However, we believe the strategy it represents is fundamental to achieving the goals herein.

FORECAST RESULTS

The following table presents the expected electricity-related costs, savings and benefits for the first three years of the Green Heating Systems initiative, as included in ENSC's 2013-2015 DSM Plan. The reported numbers include participants to the whole-house and simple rebate channels in addition to the new HVAC-only channel. They fully account for such factors as net-to-gross, interactive effects, and allocation of costs as appropriate to other accounts including Enabling Strategies and non-DSM budgets.

SAVINGS

	2013	2014	2015
Gross Savings (Incr. Ann.)			
1st Yr Electricity Svgs (MWh)	20,330	25,391	30,816
Levelized-Lifetime (MWh)	230,543	290,735	358,749
Net Savings (Incr. Ann)			
1st Yr Electricity Svgs (MWh)	10,150	12,768	15,664
Levelized-Lifetime (MWh)	125,741	159,177	196,517

COSTS

	2013	2014	2015
Program Costs			
Non-Incentive Costs ('000\$)	\$398	\$424	\$361
Incentive Costs ('000\$)	\$4,209	\$5,443	\$6,873
Total ENSC costs ('000\$)	\$4,606	\$5,868	\$7,233
Other Costs			
Participant Cost (net '000\$)	\$8,922	\$10,983	\$13,169

COST-EFFECTIVENESS

	2013	2014	2015
Unit Costs			
\$/kWh 1st Year	\$0.45	\$0.46	\$0.46
\$/kWh Lifetime Levelized	\$0.037	\$0.037	\$0.037
B/C Tests			
Lifetime Benefits ('000\$)	\$13,260	\$16,810	\$20,769
Program costs ('000\$)	\$4,606	\$5,868	\$7,233
Total resource costs ('000\$)	\$13,528	\$16,851	\$20,403
Program Administrator Cost (PAC) Test	2.88	2.86	2.87
Total Resource Cost (TRC) Test	0.98	1.00	1.02

On the whole, the Green Heating Systems initiative passes both the Total Resource Cost and Program Administrator Cost tests, the latter suggesting somewhat less than \$3 in savings for every dollar invested by ENSC.



2011 Socket Study

Final Report

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Introduction

This report presents the results of the **2011 Socket Study** conducted by Corporate Research Associates Inc. on behalf of Efficiency Nova Scotia. The overall goal of this study was to determine market penetration of energy efficient lighting (CFL and LED bulbs) and identify the degree of market transformation that has taken place in the efficiency sector. More specifically, this study sought to:

- Provide information on the type of bulbs present in each socket on the respondent's property;
- Estimate the number of hours of use of each type of lighting; and
- Probe intentions to implement energy efficient lighting.

A questionnaire was administered online between September 26 to 29, 2011. A total of 1,004 residents of Nova Scotia completed the survey, drawn from an online panel owned by Research Now. Results were weighted by region and by whether or not the respondent owns or rents his/her home, with the results being weighted to match known population parameters.

A total of 50 in-home verification visits with survey respondents were conducted in October and November 2011. These visits entailed CRA staff gaining compliance from respondents to enter their households and count their light bulbs of various types. Respondents were given \$50 as thanks for granting this compliance. Results from this component of the research are presented near the end of this report.

This report includes a detailed analysis of the data, a complete set of data tables, an executive summary, and a methodology section. All numbers are rounded to the nearest full number and, as such, may not always add up to 100 percent due to rounding. Where multiple responses are permitted, totals will exceed 100 percent.



Executive Summary

The results of the **2011 Socket Study** indicate that approximately one-half of all bulbs in Nova Scotia are energy efficient CFL or LED. Overall, residents of Nova Scotia report having an average of 26 permanent light fixture bulbs, 6 plug-in lamp bulbs, and 4 outdoor light bulbs. On average, residents have 19 energy efficient bulbs installed in their home (either CFL or LED). Residents report that their permanent light fixture bulbs and plug-in lamp bulbs are currently outfitted with a fairly even mix of regular bulbs (48% of permanent light fixture bulbs are regular bulbs and 50% of plug-in lamp bulbs are regular bulbs), and CFL bulbs (48% of permanent light fixture bulbs are CFL bulbs and 47% of plug-in lamp bulbs are CFL bulbs). LED bulbs are less than four percent of all permanent light fixture bulbs and plug-in lamp bulbs. In contrast, regular bulbs comprise approximately one-half of outdoor light bulbs, while four in ten outdoor light bulbs are CFL bulbs and one in ten are LED bulbs.

Use of energy efficient CFL or LED **permanent light fixture bulbs** is more prominent among residence owners, those who do not live in apartments, residents 35 years of age or older, households with annual incomes of \$50K or more, and among residents who use home heating energy sources other than oil or electricity. Residents report having their permanent light fixture bulbs turned on for an average of 4.7 hours daily. The usage of energy efficient **plug-in lamp bulbs** is more commonplace in households of middle-aged Nova Scotia residents, and among those who heat their homes with alternative sources of energy (i.e., other than oil or electricity). Results indicate that residents use their plug-in lamp bulbs an average of 3.6 hours per day. LED bulbs are more common in **outdoor light bulbs** than in permanent light fixture bulbs or plug-in lamp bulbs. Such energy efficient outdoor light bulbs are more common on the properties of homeowners, women, and residents who heat their homes with alternative sources of energy. Nova Scotia residents report a large variation in the length of time that their outdoor light bulbs are turned on during a typical day. Overall, residents report turning on their outdoor light bulbs for an average of approximately four hours per day.

In order to assess their intentions to improve the energy efficiency of their homes, residents were asked to indicate whether behavioural statements applied to their household in terms of replacing non-efficient bulbs in the next year with energy efficient light bulbs. Overall, four in ten residents plan to **replace at least one light fixture with a light fixture that is more energy efficient**. When asked about CFL light bulbs specifically, one-half indicate their intention to improve the efficiency of their light bulbs by **replacing at least one regular bulb with a CFL light bulb**. However, when it comes to LED light bulbs, residents appear to be more uncertain than anything, as four in ten say that they *don't know* whether they will **replace at least one regular bulb with a LED light bulb**.

A verification component of the research indicated general concordance between the online survey results and those collected via the in-home verification visits, although there was a marked discrepancy in terms of the number of permanent regular light bulbs – the survey results being notably below those found via the in-home verification visits. A qualitative finding from the verification component of the study was that in many instances the use of energy efficient light bulbs was skewed towards high use light fixtures, lamps, or outdoor lights, that is, light bulbs that tend to be more heavily used.

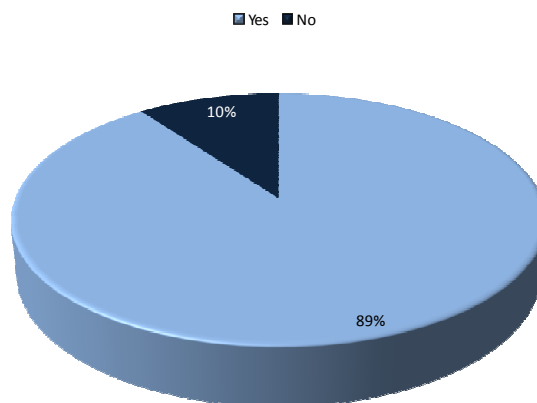


Detailed Analysis

Data Collection Process

In completing this study, nine in ten residents (89%) indicate that they purposefully walked around their home to count the number of light bulbs in place, rather than make an educated guess.

Walked Around Home to Count Number of Light Bulbs



Q.A12: Please confirm, did you actually walk around your home and count the number of light bulbs in place?

(n=1,004)

Energy Efficiency

Approximately one-half of all bulbs in Nova Scotia are energy efficient CFL or LED. LED bulbs are the least common of all bulb types.

Overall, residents of Nova Scotia report having an average of 26 permanent light fixture bulbs, 6 plug-in lamp bulbs, and 4 outdoor light bulbs. Residents report that their permanent light fixture bulbs and plug-in lamp bulbs are currently outfitted with a fairly even mix of regular bulbs (48% of permanent light fixture bulbs are regular bulbs and 50% of plug-in lamp bulbs are regular bulbs) and CFL bulbs (48% of permanent light fixture bulbs are CFL bulbs and 47% of plug-in lamp bulbs are CFL bulbs), while LED bulbs are less than four percent of all permanent light fixture bulbs and plug-in lamp bulbs. In contrast, regular bulbs comprise approximately one-half of outdoor light bulbs (53%), while four in ten outdoor light bulbs are CFL bulbs (37%) and one in ten are LED bulbs (10%).

Number* of bulbs found in ...	Overall	Regular Bulbs	Energy Efficient	
			CFL Bulbs	LED Bulbs
Permanent Light Fixture Bulbs	26	13	12	1
Plug-in Lamp Bulbs	6	3	3	0
Outdoor Light Bulbs	4	2	1	1

*NOTE: Figures rounded to nearest whole number

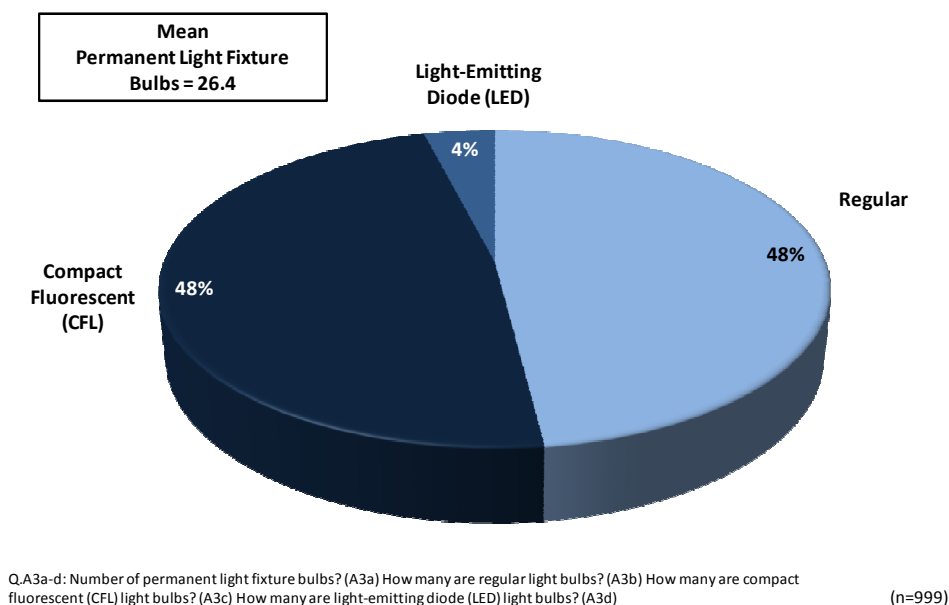


Energy Efficient Permanent Light Fixture Bulbs

Use of energy efficient CFL or LED permanent light fixture bulbs is more prominent among residence owners, Nova Scotians who do not live in apartments, residents 35 years of age or older, households with annual incomes of \$50K or more, and among residents who use home heating energy sources other than oil or electricity.

As previously indicated, a relatively equal mix of regular and CFL bulbs is currently evident in permanent light fixtures, while LED light bulbs are considerably less popular. (Tables A3a-d)

Permanent Light Fixture Bulb Types



In identifying the market penetration of energy efficient lighting in Nova Scotia, it is notable that the use of CFL bulbs is vastly more popular than the use of LED bulbs in permanent light fixtures. As previously mentioned, approximately one-half of permanent lighting bulbs are CFL (48%), while LED bulbs comprise a very small minority (4%). Energy efficient residents were identified as those most likely to use CFL bulbs in *most* of their permanent light fixture bulbs, and/or those most likely to use *any* LED bulbs. (This latter consideration regarding LED bulbs is due to the very small number of residents who utilize LED bulbs.) Those who meet this definition include residents who own their residence as opposed to rent, those who live in a single detached or duplex/townhouse dwelling, those between the ages of 35 and 54, those who heat their home with a source of energy other than electricity or oil (e.g., wood), and/or those from households with an annual household income of \$50K or more.

The following table outlines the characteristics of residents who are most likely to utilize more of each specific type of light bulb in permanent light fixtures:



Permanent Light Fixture Bulbs

Light Bulb Type	Residents Most Likely to Use More
Regular bulbs (over 50% of permanent light fixture bulbs)	• Rent residence • Live in apartment • 55 years or older • Heat home with oil or electricity
CFL (over 50% of permanent light fixture bulbs)	• Own residence • 35-54 years old • Heat home with 'other' energy source (e.g., wood) • Household income level of \$50K-\$75K
LED (at least one permanent light fixture bulb)	• Own residence • Do not live in apartment • Household income level of more than \$75K

CFL Bulb Use in Permanent Light Fixtures – Detailed Findings

Residents who are more likely to use CFL bulbs for more than one-half of their permanent light fixture bulbs include those who **own** their place of residence. However, it is notable that those who do not own their place of residence display a tendency to have either *all* of their permanent light fixture bulbs outfitted with CFL bulbs, or *none* of them. Although residents from households with a higher yearly income (more than \$75K per year) are modestly more likely than lower-income residents (less than \$50K per year) to have *at least one* CFL bulb among their permanent light fixture bulbs (92% compared to 85%), **middle income** households (\$50K-\$75K per year) are the most likely to have CFL bulbs in *all* of their permanent light fixture bulbs (17% compared to 7% among higher-income households and 13% in lower-income households). Those who utilize wood or energy sources other than electricity or oil to heat their homes are more likely to have CFLs as *at least half* their permanent light fixture bulbs (55% compared to 43% of those who use electricity and 44% of those who use oil).

LED Bulb Use in Permanent Light Fixtures – Detailed Findings

As LED usage in permanent light fixture bulbs is not common practice across Nova Scotia, CRA's analysis was based solely on whether or not respondents use *any* LED bulbs in their permanent light fixtures. To this end, residence **owners** (compared to renters) and **house dwellers** (compared to apartment dwellers) are more likely to use *at least one* LED bulb. In addition, residents with annual household incomes of more than \$75K are the most likely to have *at least one* LED bulb (28%), compared to residents from less affluent households (17%).

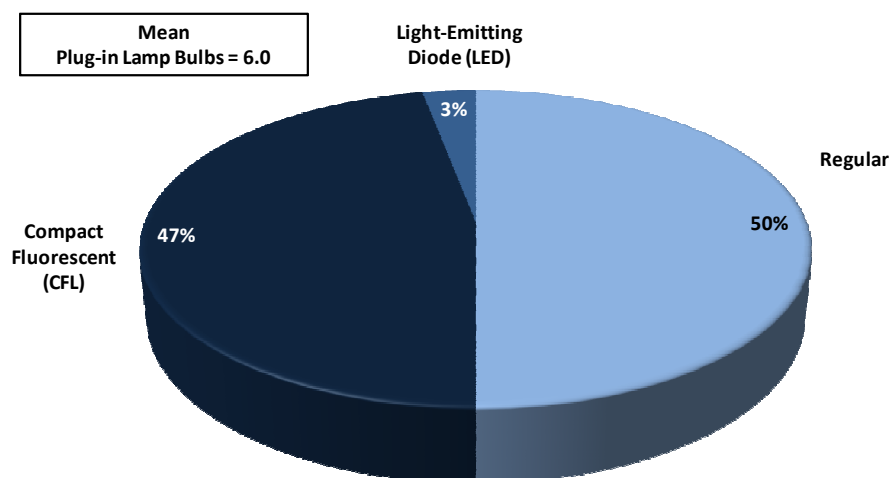


Energy Efficient Plug-in Lamp Bulbs

Plug-in lamp bulbs are less common than permanent light fixture bulbs. The usage of energy efficient bulbs is more commonplace in households of middle-aged residents, and among those who heat their homes with alternative sources of energy (i.e., other than oil or electricity).

Turning to the types of light bulbs found in plug-in lamps, as previously indicated, most plug-in lamp bulbs contain a fairly even mix of regular and CFL bulbs, while LED bulbs once again are not as popular. (Tables A6a-d)

Plug-in Lamp Bulb Types



Q.A6a-d: Number of plug-in lamp bulbs? (A6a) How many are regular light bulbs? (A6b) How many are compact fluorescent (CFL) light bulbs? (A6c) How many are light-emitting diode (LED) light bulbs? (A6d)

(n=953)

The distribution of energy efficient bulbs in plug-in lamps is similar to that of energy efficient bulbs in permanent lighting fixture bulbs that was discussed above, as about one-half of plug-in lamp bulbs are CFL (47%), and considerably fewer are LED bulbs (3%). Generally speaking, those most likely to use energy efficient light bulbs (CFL and/or LED) as their plug-in lamp bulbs include residents between the ages of 35-54 years, and residents who heat their home via means other than oil or electricity, such as through wood.

The following table outlines the characteristics of residents who are most likely to use more of each specific type of plug-in lamp bulb:



Plug-in Lamp Bulbs

Light Bulb Type	Residents Most Likely to Use More
Regular bulbs (over 50% of plug-in lamp bulbs)	- Residents of Mainland Nova Scotia - Under the age of 35 - Heat home with oil or electricity
CFL (over 50% of plug-in lamp bulbs)	- Residents between 35-54 years old - Heat home with other energy source, (e.g., wood)
LED (at least one plug-in lamp bulb)	No population subgroup differences

CFL Bulb Use in Plug-in Lamps – Detailed Findings

Higher proportions of residents who use *at least one* CFL bulb can be found in **HRM** (73%) compared to the rest of the mainland (66%) and Cape Breton Island (59%). In fact, residents of Cape Breton are statistically less likely to use CFL bulbs as compared to residents from elsewhere in Nova Scotia. Interestingly, younger residents (aged 18-34) are less likely than older residents (aged 55 or older) to have *any* CFL plug-in lamp bulbs (38% have none, compared to 29% of residents 55 or older). **Middle-aged residents** (35-54 years of age) have a slightly higher average proportion of CFL plug-in lamp bulb usage (50%) as compared to their younger counterparts (42%). These middle-aged residents are also more likely to have CFLs for *all* their plug-in lamp bulbs (31%), as compared to older residents (21%). Finally, residents who use **alternative sources of energy** (such as wood) to heat their homes are more likely to have CFL plug-in lamp bulbs (55%), as compared to those who use oil (45%) or electricity (46%).

LED Bulb Use in Plug-in Lamps – Detailed Findings

Residents living in **duplex/townhouse**-style homes are more likely to have some LED plug-in lamp bulbs (12%), compared to those living in 'other' types of dwellings (0%) such as retirement homes or student dormitories. Apart from this small group difference, no other difference is evident across population subgroups in terms of LED Bulb Use in Plug-in Lamps.

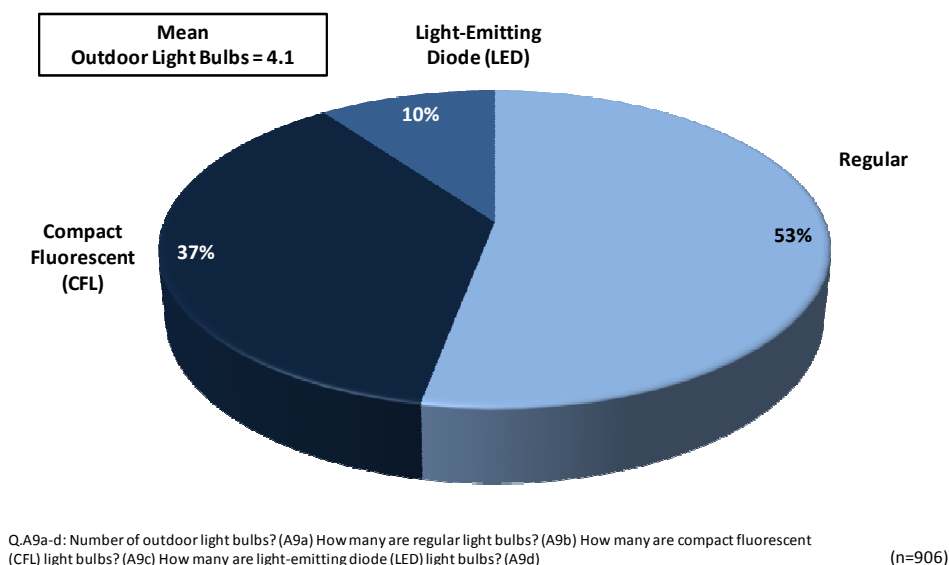


Energy Efficient Outdoor Light Bulbs

Approximately one-half of outdoor light bulbs are energy efficient CFLs or LEDs. Such energy efficient outdoor light bulbs are more common on the properties of homeowners, women, and residents who heat their homes with alternative sources of energy.

One-half of outdoor light bulbs are outfitted with regular bulbs (53%), with the other half being energy efficient bulbs. Four in ten outdoor light bulbs are CFL (37%) and one in ten are LED (10%). As such, LED bulbs are significantly more common in outdoor light bulbs than in permanent light fixture bulbs (4%) or plug-in lamp bulbs (3%). (Tables A9a-d)

Outdoor Light Bulb Types



Energy efficient light bulbs are used more commonly by residents who own their dwelling (instead of renting), and among Nova Scotians who use energy sources other than electricity or oil to heat their homes.

The following table outlines the characteristics of residents who are most likely to use more of each specific type of outdoor light bulb:



Outdoor Light Bulbs

Light Bulb Type	Residents Most Likely to Use More
Regular bulbs (over 50% of outdoor light bulbs)	- Do not own residence - Use oil or electricity to heat home - Live in an apartment
CFL (over 50% of outdoor light bulbs)	- Own residence - Use other energy sources (e.g., wood) to heat home
LED (at least one outdoor light bulb)	- Own residence - Women - Part-time employment status

CFL Outdoor Light Bulb Usage – Detailed Findings

Those who **own** their residence are more likely to have *at least one* CFL outdoor light bulb (53%), as compared to those who are not homeowners (38%). Interestingly, **men** are more likely than women to have CFLs as *up to half* of their outdoor light bulbs (23% compared to 16%). **Older residents** (55+) are also more likely to have CFL bulbs as *up to half* of their outdoor light bulbs (23%), as compared to younger residents aged 18 to 34 (15%). Six in ten residents who heat their homes using **other energy sources** have *at least one* CFL outdoor light bulb (62%), compared to one-half of oil or electricity users (49%). Other energy source users are also more likely to have CFL bulbs as *more than half* of their outdoor light bulbs (11%), as compared to oil (6%) or electricity (5%) users. Residents living in **apartments** are likely to display a tendency to outfit “all or none” of their outdoor light bulbs with CFL bulbs, as the majority do not own *any* outdoor CFL bulbs (71%), but those who do have outfitted *all* their outdoor light bulbs with them (27%). Of note, the average number of outdoor light bulbs in apartments is less than one (0.8). Residents living in **detached** or **duplex** houses are more likely than those in apartments to have *at least one* CFL outdoor light bulb (54% and 50%, as compared to 29%). Similar to apartment dwellers, residents with lower household incomes (i.e., less than \$50K per year) also display the tendency to outfit either *all* or *none* of their outdoor light bulbs with CFL bulbs, while residents from higher-income households (i.e., over \$75K per year) tend to have a mix of CFL and regular bulbs.

LED Outdoor Light Bulb Usage – Detailed Findings

Residents who are more likely to have *at least one* LED outdoor light bulb include **homeowners** (17%) compared to those who do not own their residence (10%), **women** (19%) compared to men (12%), and residents with a **part-time** employment status (27%) compared to any other employment status (i.e., 13% of residents with full time employment and 17% of residents with other employment statuses).



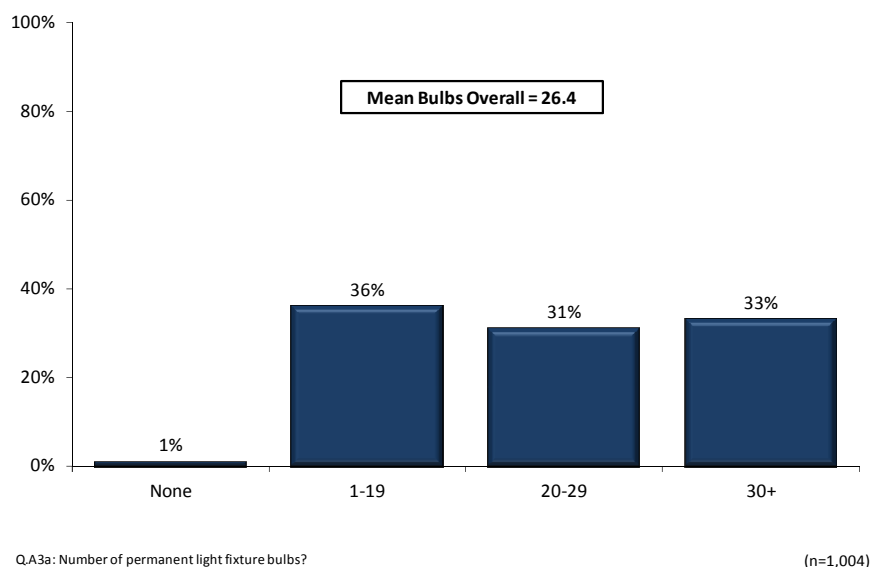
Light Bulb Count and Usage

Permanent Light Fixture Bulbs

Permanent light fixture bulbs are the most common across Nova Scotia, with slightly more than one-half being used on a typical day.

As noted above, Nova Scotia residents have an overall mean average of 26 permanent light fixture bulbs. Approximately four in ten residents have fewer than 20 permanent light fixture bulbs (37%), while three in ten have between 20 and 29 permanent light fixture bulbs (31%). One in three residents report owning 30 or more permanent light fixture bulbs (33%).

Number of Permanent Light Fixture Bulbs

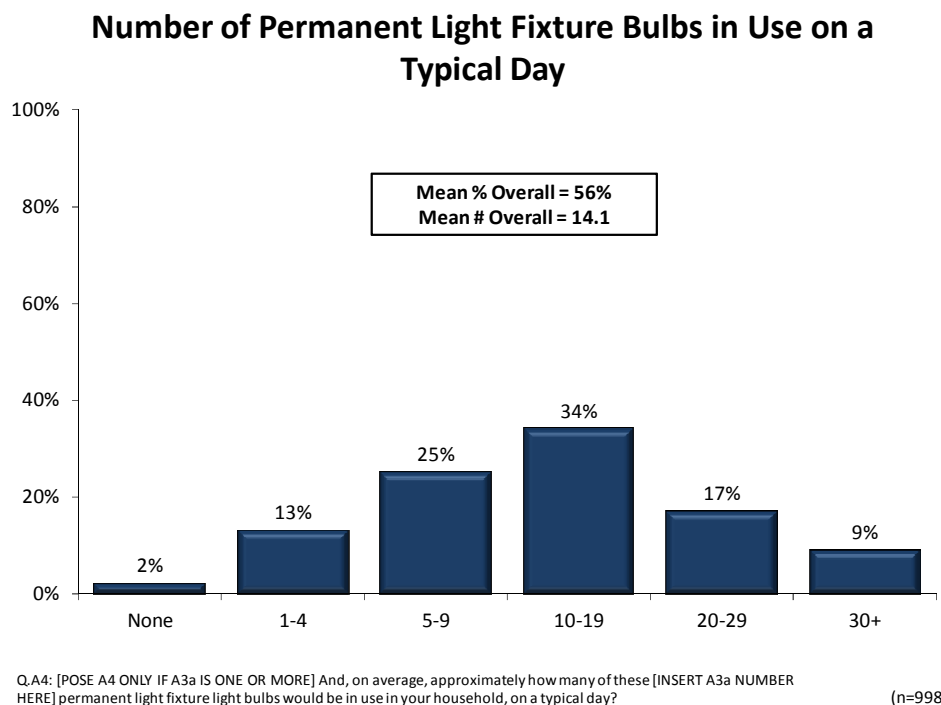


The incidence of permanent light fixture bulbs increases with age and yearly household income. As may be expected given that apartments often are comparatively smaller than houses, residents in apartments report having the lowest number of permanent light fixture bulbs (13), duplex/townhouse dwellers report having a number close to the overall average (23), and occupants of detached homes report having the highest number of permanent light fixture bulbs (30). (Table A3a)

Residents report using an average of 14 permanent light fixture bulbs on a typical day. This amounts to slightly more than one-half of their total permanent light fixture bulbs (56%) being typically used. Another helpful representation of permanent light fixture bulb use would be to examine the *proportion* of permanent light fixture bulbs used in relation to each resident's total number of permanent light fixture bulbs. Analysed from this perspective, one-half of residents indicate that on a typical day they use *less than half* of the permanent light fixture bulbs in their home (46%). Four in ten use *more than half, but not all* (41%), while one in ten residents indicate using *all* of the permanent light fixture bulbs in their home on a daily basis (12%).



Still another manner of discussing the use of permanent light fixture bulbs on a typical day is presented in the following graph. This graphic displays the *number* of permanent light fixture bulbs in use on a typical day, as opposed to the previously-discussed *proportions*. (Table A4)

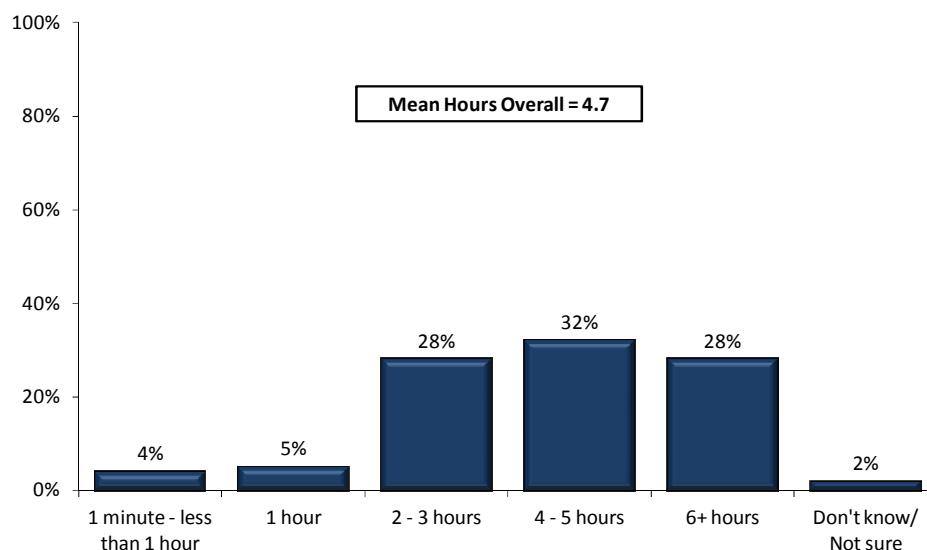


When considering the proportion of permanent light fixture bulbs used in a typical day relative to residents' total number of permanent light fixture bulbs, several differences across population subgroups are evident. Compared to residents who own their home, those who do not own their own home are more likely to use the majority of their permanent light fixture bulbs on a typical day. The number of permanent light fixture bulbs in use on a typical day decreases among older residents, and the likelihood of using *all* of one's permanent light fixture bulbs on a typical day is lower among higher household income Nova Scotians.

On average, residents report using their permanent light fixture bulbs for 4.7 hours on a typical day. Relatively equal groups of three in ten residents report turning on their permanent light fixture bulbs for two to three hours (28%), four to five hours (32%), or six hours or more (28%), while a combined one in ten residents use their permanent light fixture bulbs for one hour or less on a typical day (9%). (Table A5)



Number of Hours You Have Turned on Permanent Light Fixture Bulbs on a Typical Day



Q.A5: [POSE A5 ONLY IF RESPONSE TO A4 IS ONE OR MORE] Now we would like you to think of a typical day. About how many hours, on average, do you have turned on each of these [INSERT RESPONSE FROM A4] permanent light fixture bulbs? (n=981)

Although fewer permanent light fixture bulbs are present per capita among Cape Breton residents (22) as compared to HRM (27), it is noteworthy that these bulbs are used for almost one hour longer on average per day (i.e., 5.1 hours compared to 4.3 hours). Homeowners are less likely than those who do not own their place of residence to have their permanent light fixture bulbs turned on for six hours or more. Similarly, those residing in single, detached homes are less likely to have their permanent light fixture bulbs turned on for six hours or more as compared to apartment dwellers, while young residents (18-34) indicate that they are more likely than middle-aged residents (35-54) to have their permanent light fixture bulbs turned on for six hours or more. (Table A5)

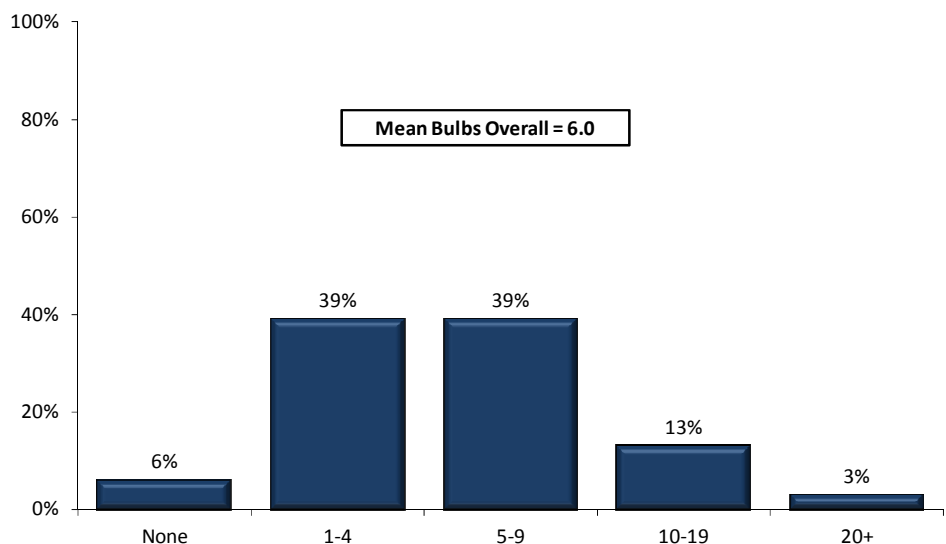
Plug-in Lamp Bulbs

Although there are considerably fewer plug-in lamp bulbs as compared to permanent light fixture bulbs, usage of plug-in lamp bulbs on a typical day is similar to the permanent light fixture bulb use pattern.

Across Nova Scotia, plug-in lamp bulbs are considerably less common as compared to permanent light fixture bulbs. As previously reported, residents have an average of six plug-in lamp bulbs. Slightly less than one-half of residents have fewer than five plug-in lamp bulbs (45%), while four in ten own between five and nine plug-in lamp bulbs (39%). Just under one in five residents report having ten or more plug-in lamp bulbs (16%).



Number of Plug-In Lamp Bulbs



Q.A6a: Number of plug-in lamp bulbs?

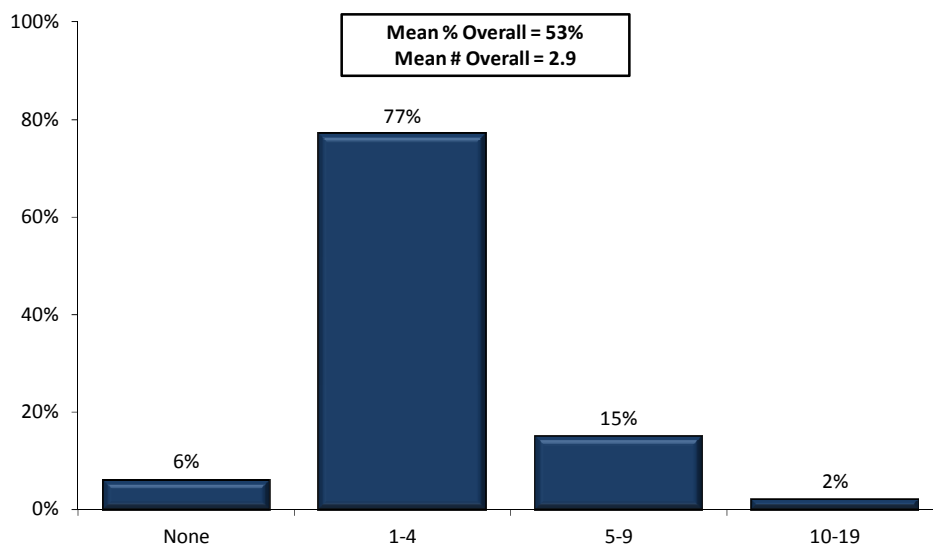
(n=1,004)

The number of plug-in lamp bulbs in one's home increases with age, as older residents (55+) are three times more likely than younger residents (18-34), and twice as likely as middle-aged (35-54) residents, to have more than ten plug-in lamp bulbs. Interestingly, residents with full-time or part-time employment status are less likely to have more than ten plug-in lamp bulbs, as compared to those with some other employment status. Residents with full-time or part-time status have one fewer plug-in lamp bulb, on average, as compared to residents with some other employment status. (Table A6)

Given that the average resident owns six plug-in lamp bulbs, it is perhaps not surprising that the vast majority of respondents indicate that they use fewer than five plug-in lamp bulbs on a typical day (83%). Another helpful representation of the use of plug-in lamp bulbs would be to examine the *proportion* of plug-in lamp bulbs used in relation to each resident's total number of plug-in lamp bulbs. On average, residents use approximately one-half of their plug-in lamp bulbs on a typical day (53%). Six in ten indicate that they use *less than half*, or *none*, of their plug-in lamp bulbs on a typical day (58%), while close to one-quarter indicate that they use *more than half, but not all*, of their plug-in lamp bulbs (23%). An additional two in ten report that they use *all* their plug-in lamp bulbs on a typical day (19%). Still another manner of discussing the use of plug-in lamp bulbs on a typical day is presented in the following graph. This graphic displays the *number* of plug-in lamp bulbs in use on a typical day, as opposed to the previously-discussed *proportions*.



Number of Plug-In Lamp Bulbs in Use on a Typical Day



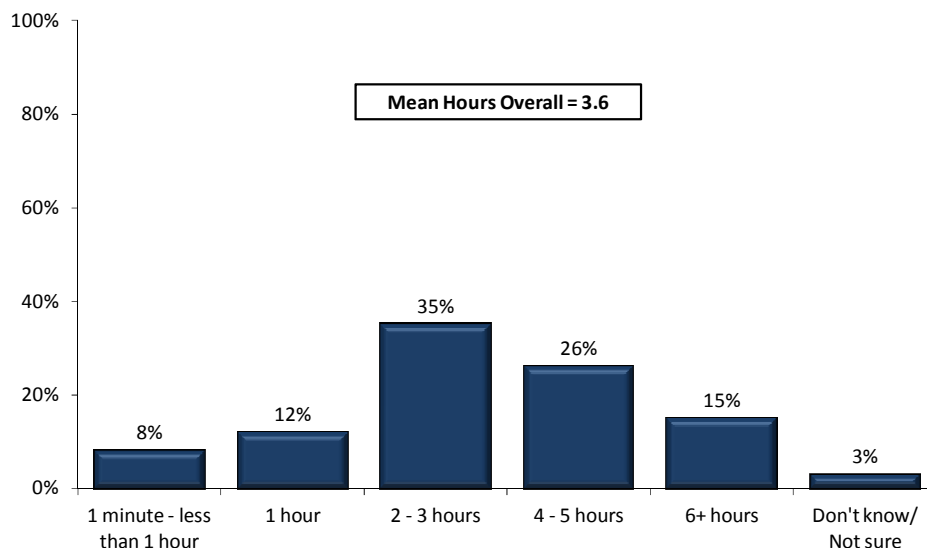
Q.A7: [POSE A7 ONLY IF A6a IS ONE OR MORE] And, on average, approximately how many of these [INSERT A5a NUMBER HERE] plug-in lamp bulbs would be in use in your household, on a typical day? (n=941)

Proportional differences in plug-in lamp bulb usage are evident across population subgroups. By region, residents of Cape Breton who have plug-in lamp bulbs are slightly more likely than HRM residents to use *none* of their plug-in lamp bulbs on a typical day (11% compared to 5%). Nova Scotians who do not own their own place of residence are twice as likely as residence owners to use *all* their plug-in lamp bulbs on a typical day (33% compared to 16%). Plug-in lamp bulb usage decreases noticeably as age increases, and also is lower among those with greater annual household incomes.

Residents use their plug-in lamp bulbs an average of 3.6 hours per day. Across Nova Scotia, on a typical day a small minority turn on their plug-in lamp bulbs either for less than one hour or not at all (8%), while one in ten say their plug-in lamp bulbs are turned on for about an hour (12%). More than one-third of residents have their plug-in lamp bulbs turned on for two to three hours on a typical day (35%), while one-quarter indicate that their plug-in lamp bulbs are on for four to five hours daily. A sizeable minority indicate that their plug-in lamp bulbs are used for six hours or more per day (15%).



Number of Hours You Have Turned on Plug-In Lamp Bulbs on a Typical Day



Q.A8: [POSE A8 ONLY IF RESPONSE TO A7 IS ONE OR MORE] Now we would like you to think of a typical day. About how many hours, on average, do you have turned on each of these [INSERT RESPONSE FROM A7] plug-in lamp bulbs?

(n=887)

Among those most likely to have their plug-in lamp bulbs turned on for six hours or more are Cape Breton residents, Nova Scotians who do not own their residence, and residents with yearly household incomes of less than \$50K (compared to those with household incomes of \$50K to \$75K). Residents 55 years or older are more likely than their younger counterparts to have their plug-in lamp bulbs turned on for more than four hours. (Table A8)

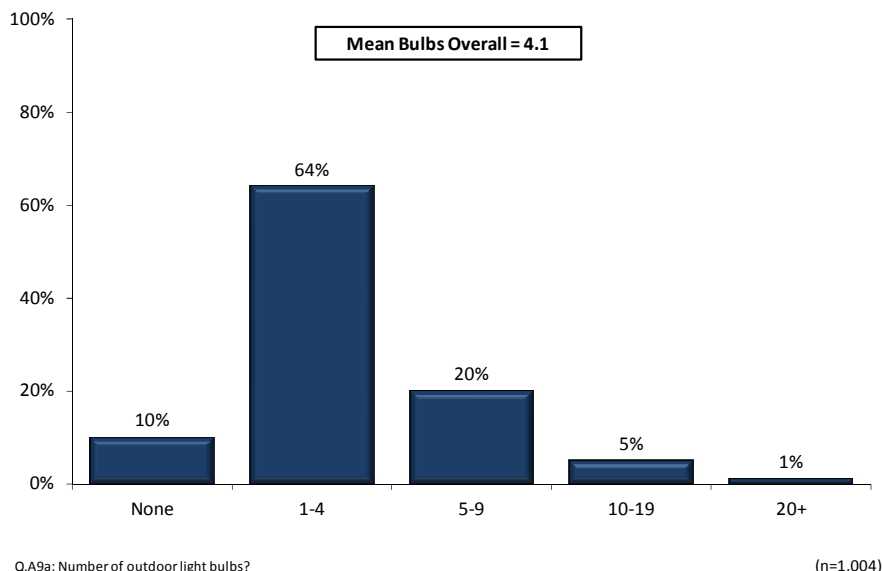
Outdoor Light Bulbs

Outdoor light bulbs are less common than permanent light bulbs and plug-in lamp bulbs.

Nova Scotia residents own an average of only four outdoor light bulbs. Three-quarters of the population have fewer than five outdoor light bulbs (74%). Two in ten have five to nine outdoor light bulbs (20%), while a small minority have either 10 to 19 (5%) or 20 or more (1%) outdoor light bulbs. (Table A9a)



Number of Outdoor Light Bulbs

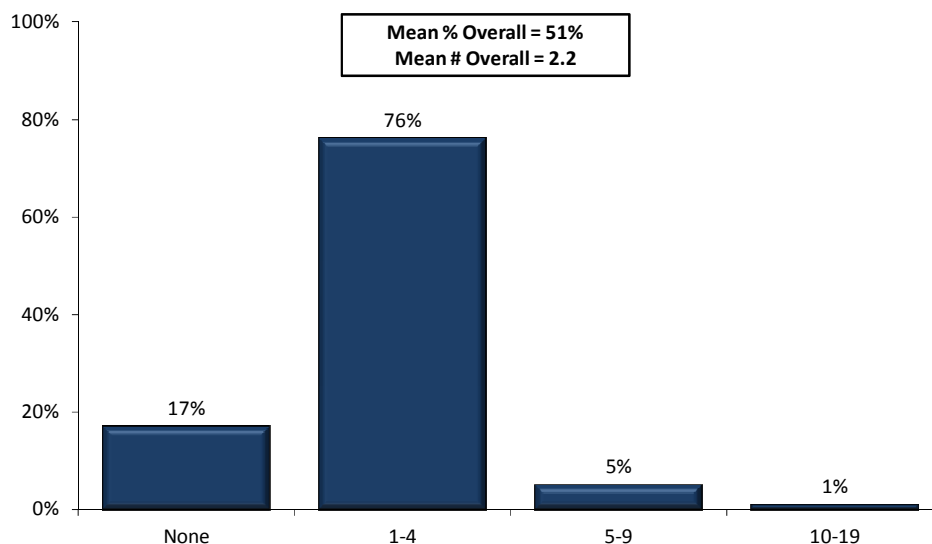


The quantity of outdoor light bulbs on one's property varies considerably according to different characteristics across the population. By region, residents on mainland Nova Scotia beyond HRM are slightly more likely (95%) than residents of HRM (86%) or Cape Breton (90%) to have *at least one* outdoor light bulb, although residents of both Cape Breton (70%) and the rest of mainland Nova Scotia (67%) are more likely than HRM residents (59%) to have between one and four outdoor light bulbs. Almost all homeowners (96%) have at least one outdoor light bulb, compared to only two-thirds of those who do not own their place of residence (66%). In fact, homeowners indicate owning an average of approximately three times as many outdoor light bulbs (4.8) as compared to non-homeowners (1.5). Similarly, one-half of apartment dwellers do *not* own an outdoor light bulbs at all (53%), compared to fewer than one in twenty residents who live in a detached home (3%) or a duplex/townhouse (4%). On average, residents of single, detached houses have the most outdoor light bulbs of any dwelling type (5.1), followed by residents of duplex/townhouse (2.5), and apartment dwellers, who own the least (0.8). Finally, the number of outdoor light bulbs tends to increase with yearly household income.

As the majority of residents own less than five outdoor light bulbs, it follows that the majority use less than five outdoor light bulbs (76%) on a typical day. Another helpful representation of outdoor light bulbs use would be to examine the proportion of outdoor light bulbs used in relation to each resident's total number of outdoor light bulbs. On average, residents use one-half of the outdoor light bulbs on their property on a typical day (51%). As slightly less than one-half of residents use *less than half* (but at least one) of their outdoor light bulbs (46%), and two in ten indicate using *none* of their outdoor light bulbs (17%) despite having at least one, the majority of residents use *less than half* of the outdoor light bulbs on their property on a typical day. One-quarter use *all* of their outdoor light bulbs (25%), while an additional one in ten use *more than half* (but not all) of their outdoor light bulbs (12%). The following graph displays the *number* of outdoor light bulbs in use on a typical day, as opposed to the previously-discussed *proportions*. (Table A10)



Number of Outdoor Light Bulbs in Use on a Typical Day



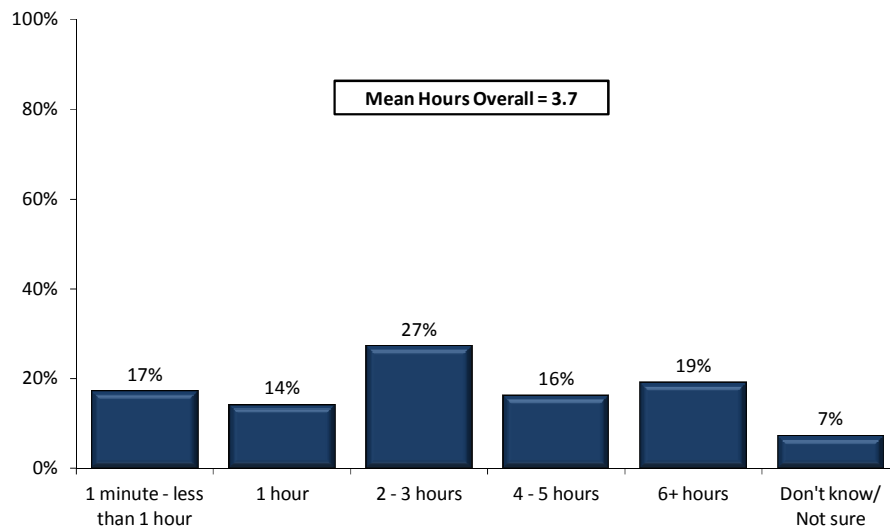
Q.A10: [POSE A10 ONLY IF A9a IS ONE OR MORE] And, on average, approximately how many of these [INSERT A9a NUMBER HERE] outdoor light bulbs would be in use in your household, on a typical day? (n=893)

Outdoor light bulb usage also varies across several demographic characteristics. Residents of Cape Breton are more likely to use the *all* of their outdoor light bulbs on a daily basis compared to the rest of Nova Scotia, while HRM residents are more likely than Cape Breton residents to use *none* of their outdoor light bulbs. Compared to homeowners, Nova Scotians who do not own their residence show a stronger tendency to use either *all* (45% compared to 21%) or *none* (27% compared to 15%) of their outdoor light bulbs on a daily basis. A similar finding is observed among those who reside in apartments, who are about twice as likely to show an “*all or nothing*” pattern of usage of outdoor light bulbs compared to those residing in single, detached houses or duplex/townhouses. Usage of outdoor light bulbs appears to decrease with respondent age. Further, residents who use electricity to heat their home are modestly less likely than those who use oil or other sources of energy to use *any* of their outdoor light bulbs on a typical day (79% compared to 85%).

Residents report a large variation in the length of time that their outdoor light bulbs are turned on during a typical day. Overall, residents report turning on their outdoor light bulbs for an average of approximately four hours per day. One in five report leaving outdoor light bulbs on for six hours or more (19%), while less than two in ten use their outdoor light bulbs for four to five hours on a typical day (16%). Three in ten indicate they use these lights for two to three hours (27%), and slightly more than one in ten indicate that they typically use their outdoor light bulbs for one hour (14%). Two in ten residents report using their outdoor light bulbs for less than one hour on a typical day (17%). (Table A11)



Number of Hours You Have Turned on Outdoor Light Bulbs on a Typical Day



Q.A11: [POSE A11 ONLY IF RESPONSE TO A10 IS ONE OR MORE] Now we would like you to think of a typical day. About how many hours, on average, do you have turned on each of these [INSERT RESPONSE FROM A10] outdoor light bulbs? (n=730)

Across the population, residents in Cape Breton turn on their outdoor light bulbs for approximately one hour longer (4.8 hours) as compared to HRM residents (3.7 hours) and those elsewhere on mainland Nova Scotia (3.5 hours). There is a difference in the average length of time that younger residents aged 18 to 34 leave their outdoor light bulbs on (4.2 hours), as compared to older residents aged 55 years or over (3.1 hours). Older residents are less likely than younger residents to leave their outdoor light bulbs on for six hours or more.

Intentions to Implement Energy Efficient Light Bulbs

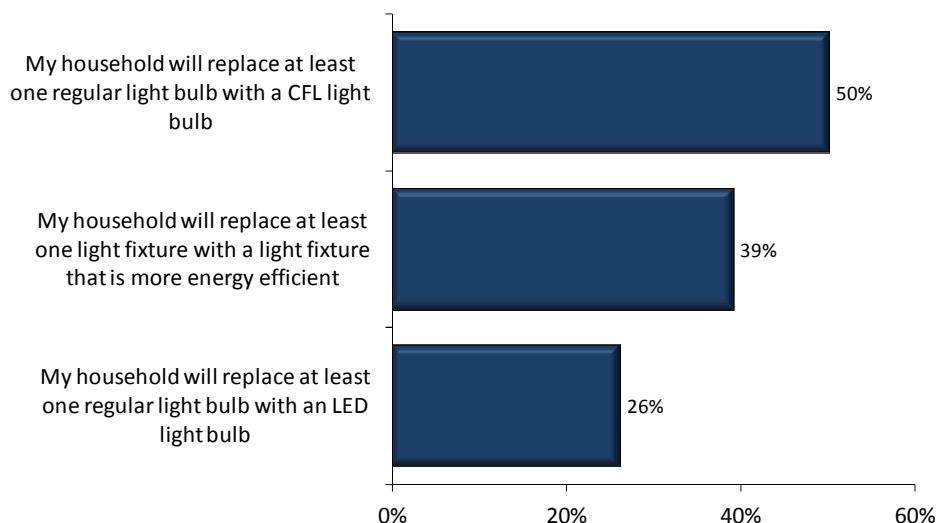
Up to one-half of residents intend to replace non-efficient bulbs in the next year with energy efficient light bulbs.

In order to assess their intentions to improve the energy efficiency of their homes, residents were asked to indicate whether behavioural statements applied to their household in terms of replacing non-efficient bulbs in the next year with energy efficient light bulbs. Overall, four in ten residents plan to **replace at least one light fixture with a light fixture that is more energy efficient** (39%). Of note, one-third of residents answered that they are unsure whether they would do so (34%), while three in ten said that they would not (27%). Interestingly, when asked about CFL light bulbs specifically, significantly more residents indicate their intention to improve the efficiency of their light bulbs by **replacing at least one regular bulb with a CFL light bulb** (50%). Another three in ten indicate that they are unsure (29%), while only two in ten say that they will not do so (21%). However, when it comes to LED light bulbs, residents appear to be more uncertain than anything, as four in ten say that they **don't know** whether they will **replace at least one regular bulb with a LED light bulb** (44%). One-quarter claim that they will do so (26%), while three in ten say that they will not (30%). (Tables A13a-c)



Household Will Replace Light Bulb Types With...

(% Saying Yes, applies)



Q.A13a-c: Thinking ahead over the next year, please indicate which, if any, of the following statements apply to your household.

(n=1,004)

In terms of replacing one light fixture with one that is more energy efficient, the only population difference that emerged was for residents who heat their home with oil (36%). These residents are less likely than those who heat their homes with electricity (44%) to indicate that they will replace at least one light fixture with one that is more energy efficient. As previously reported, residences heated with alternative sources of energy, including wood, are more likely to have higher proportions of CFL bulbs as compared to residences heated with oil or electricity. Thus from one perspective, residents who heat their homes with alternative sources of energy are at the forefront of energy efficiency.

Turning to CFL bulbs specifically, **residence owners** are more likely than non-owners to indicate that they intend over the next year to replace at least one regular bulb with a CFL bulb (52% compared to 43%). This is interesting given that (as previously reported) residence owners are already more likely to have higher proportions of CFL bulbs than non-owners in their permanent light fixture bulbs as well as in their outdoor lights. Similarly, apartment dwellers are less likely (39%) than those living in **single, detached** houses (53%) or **duplexes/ townhouses** (53%) to indicate that they intend over the next year to replace at least one regular bulb with a CFL bulb. Residents from households with **higher annual household incomes** (over \$75K) are more likely than those from households with lower incomes (less than \$50K) to state their intention to replace at least one regular bulb with a CFL bulb in the next year.



In-Home Verification Visits

As mentioned in the Introduction, a total of 50 in-home verification visits were made among survey respondents, to count the actual number of bulbs within surveyed households. A comparison of survey versus verification visit results is presented in this section of the report. A key overall finding, as evident in the table immediately below, is that survey respondents notably understated on their survey questionnaire responses the number of regular light bulbs in permanent light fixtures in their households. Survey responses very closely match the verification visit results in terms of CFL bulbs, and the results between the two groups are relatively close in terms of LED bulbs.

Panel vs. Site Visit Analysis

	CFL			Regular			LED		
	Panel Survey	Site Visit	Diff-erence	Panel Survey	Site Visit	Diff-erence	Panel Survey	Site Visit	Diff-erence
Permanent	14.3	14.8	↑0.5	13.2	24.1	↑10.9	1.5	.3	↓1.2
Plug-in	3.7	3.8	↑0.1	2.6	4.8	↑2.2	.3	.4	↑.1
Outdoor	1.6	1.5	↓0.1	2.2	4.4	↑2.2	.5	.1	↓.4

CFLs

Mean scores suggest that panel members accurately count the number of CFL bulbs in their home. That said, 34 percent underestimated their number of permanent CFL bulbs by at least three bulbs, and 23 percent overestimated by the same amount. The majority of residents correctly estimates their number of outdoor or plug in CFL bulbs.

Estimate of number of light bulbs	Permanent CFL	Plug-In CFL	Outdoor CFL
Underestimated by 11+	7%	2%	n/a
Underestimated by 3-10	27%	17%	9%
Correctly estimated within 2	43%	67%	82%
Overestimated by 3-10	19%	9%	8%
Overestimated by 11+	4%	5%	n/a

Regular Light Bulbs

The majority of residents underestimate the number of regular permanent light bulbs in their home (72%). Four in ten underestimate the number of plug-in regular light bulbs (39%), while the majority correctly estimates the number of regular outdoor light bulbs (78%).



Estimate of number of light bulbs	Permanent Regular	Plug-In Regular	Outdoor Regular
Underestimated by 11+	43%	2%	8%
Underestimated by 3-10	29%	37%	5%
Correctly estimated within 2	17%	50%	78%
Overestimated by 3-10	7%	8%	9%
Overestimated by 11+	2%	2%	n/a

LED Bulbs

Residents are generally correct when estimating the number of LED bulbs in their home, with at least three-quarters of residents correctly estimating their permanent, plug-in and outdoor LED light bulbs.

Estimate of number of light bulbs	Permanent LED	Plug-In LED	Outdoor LED
Underestimated by 11+	n/a	n/a	n/a
Underestimated by 3-10	6%	7%	2%
Correctly estimated within 2	77%	91%	91%
Overestimated by 3-10	14%	2%	6%
Overestimated by 11+	2%	n/a	n/a



Study Methodology

Questionnaire Design and Survey Administration

The questionnaire used for this study was designed by CRA, in consultation with Efficiency Nova Scotia staff members. Prior to being finalized, the survey was pre-tested on a small number of respondents to ensure the appropriateness of the questions and response categories.

This survey of a general public online panel was conducted using an online panel from September 26 to 29, 2011, with adult residents in Nova Scotia aged 18 or older.

The survey was programmed by Nooro Online Research, and the general public panel members utilized for sampling purposes were drawn from an online panel owned by Research Now. CRA on many occasions has successfully called upon the professional services of Nooro Online Research as well as Research Now.

The total number of completed surveys for the present study was 1,004.

The survey required an average of just over 9 minutes to complete.

A total of 50 in-home verification visits with survey respondents were conducted in October and November 2011 (Christmas lights were recorded, but not included in the final tabulated results). These visits entailed CRA staff gaining compliance from respondents to enter their households and count their light bulbs of various types. Respondents were given \$50 as thanks for granting this compliance. The visits occurred across the province, with a distribution as follows:

- Halifax Regional Municipality: 23 visits
- South Shore: 4 visits
- Annapolis Valley: 9 visits
- Northern NS: 7 visits
- Cape Breton Island: 7 visits

The collected data from the verification process was weighted to match the actual distribution of residents within Nova Scotia.





Fuel Switching / Substitution Pilot Program

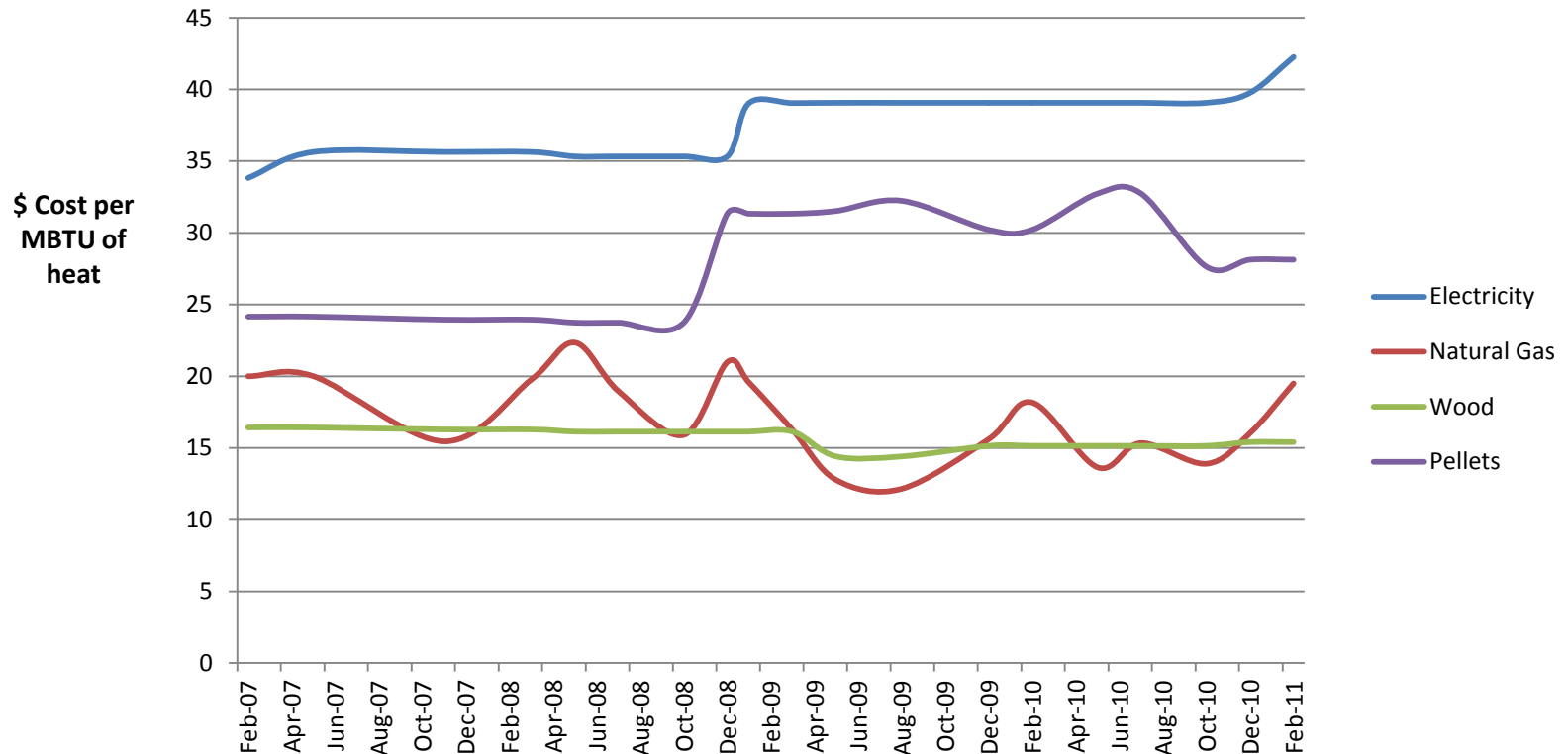
Josh McLean
ENSC Program Manager

DSM Stakeholder Consultation Session

November 3, 2011

Reasons to Change

Trend of Home Heating Costs in Nova Scotia (2007-2011)



Eligibility

- Existing Homes
- Heat primarily with electric resistance heating
- Must be pre-approved by ENSC
- Minimum natural gas efficiency standards
- Minimum wood/pellet emissions standards
- Qualified installers
- Complete by December 31, 2011

How to take part

1. Send pre-approval application form to ENSC
2. Receive approval
3. Purchase and install qualifying equipment
4. Send in rebate application form and supporting docs
5. Receive rebate cheque

Rebates

Full Conversion

- Rebates for new central heating system and installation
 - Natural gas = 30% rebate (with cap)
 - Wood / Pellet = 40-60% rebate (with cap)
- Up to \$6,500 in additional rebates to remove electric and install new distribution system
- Rebates for new domestic water heating system
 - Up to \$750

Substitute

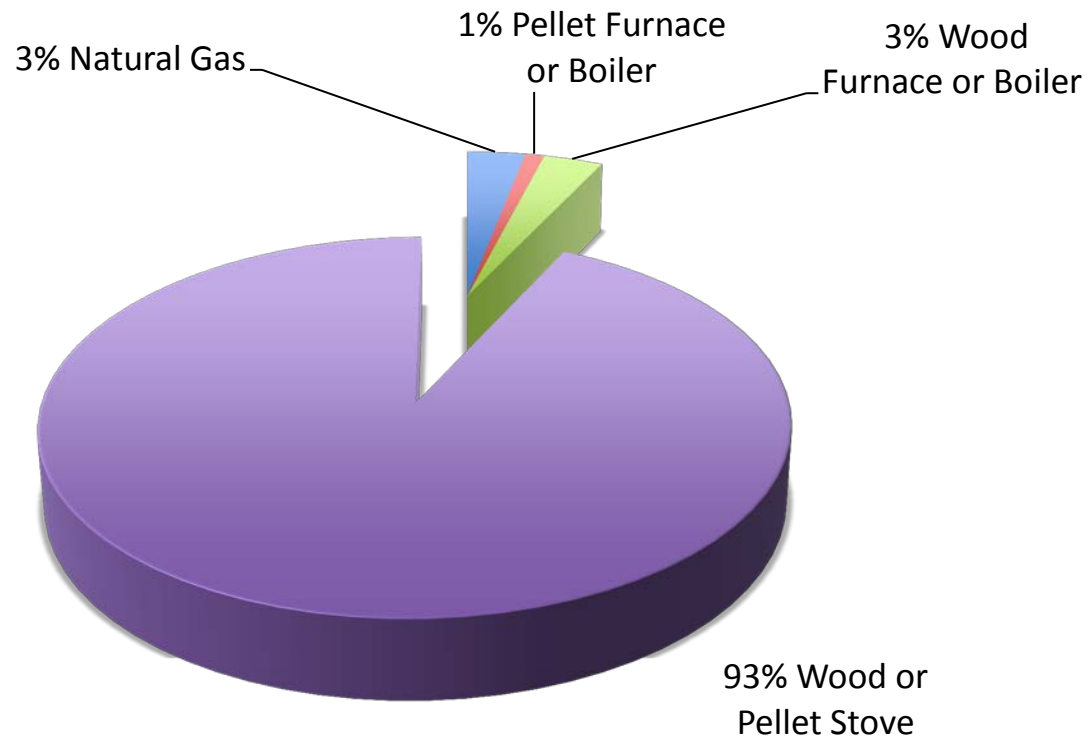
- Wood / Pellet stoves = 20% rebate, up to \$900

Marketing Initiatives

- Direct mail-out to all homes with access to natural gas
- Collaboration with Wood Energy Technology Transfer (WETT)
Nova Scotia
- Newspaper and radio advertising
 - Cape Breton
 - Remainder of the Province
- Online
 - Facebook
 - ViewPoint
 - Efficiency Nova Scotia website

Results to Date

350 Pre-approval applications



Results to Date

- 25% of installations completed
- Anticipate 400 installations
- Projected 2011 result = 1.8 GWh savings

Key Learnings

- Industry support
- Wood / pellet stove popularity
- Challenges with full natural gas conversions
- Review additional options for conversions for next year

Thank you

Josh McLean

902-470-3541

jmclean@efficiencyns.ca



Green Schools Nova Scotia

Laura Sinclair
ENSC Program Manager

DSM Stakeholder Consultation Session

November 3, 2011

Overview:

- Goal: enhance sustainability initiatives in NS schools and engage students through education and participation.
- Step-by-step, long-term, whole school process
- Working with Clean NS to deliver the pilot program in 2011
- 2011 Target: 10-15 schools province-wide

- Support from NS Minister of Education
- 17 schools participating, 8 school boards engaged
- Energy tracking system has been sourced and is being installed
- Interactive website for students, teachers

- Key Learnings:
 - Awareness of inefficiencies and waste
 - Sustainability
 - Energy efficiency, food sources, grounds, operations, procurement, transportation, water and waste
 - Teamwork, leadership
 - Stewardship, active citizenship

- Next Steps:
 - Continuing the program in 2012
 - RFP to be released in November
 - Program will expand to include more schools
 - 2011 participants will move to next phase of Sustainability Plans
 - Building on existing relationships and school resources



Efficiency Nova Scotia Demonstration Homes

*Laura Sinclair
ENSC Program Manager*

DSM Stakeholder Consultation Session

November 3, 2011

- Overview:
 - Formerly known as Advanced Houses and EcoHome
 - Goal: Educate the general public, residential construction industry, government and special interest groups on the importance of (and new technologies in) energy efficiency in new home construction
 - Working with NS Home Builders' Association
 - Two Phases: Design Phase and Build Phase

- Two homes: Completed on Oct. 1, 2011
- Builders: Denim Homes (Sackville) and Whitestone Developments (Dartmouth)
- Most energy efficient homes in NS – EnerGuide ratings of 96 and 94
- Great marketing campaign – raising awareness
 - Grand Opening, Open Houses, tours and other events
 - Political interest (provincial and municipal)
 - Print and broadcast media
 - Website and social media

- Key Learnings:
 - Latest technologies in energy efficient home construction
 - Realistic, affordable components to implement into any new home
 - Reduces owners' carbon footprint while saving them money
 - Represents the future of the residential construction industry

- Program Wrap-up:
 - Open Houses run until the end of November
 - Will continue to promote energy efficient technologies used in the Efficiency NS Demonstration Homes program
 - Website will continue to educate customers on the learnings/features generated by this pilot

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NOVA SCOTIA
HOME BUILDERS' ASSOCIATION

a message from

Allan Crandlemire

CEO, EFFICIENCY NOVA SCOTIA CORPORATION

The Efficiency Nova Scotia Demonstration Homes are two great projects that will help educate Nova Scotians on how to use energy better. The remarkable design and construction of these homes prove that energy efficiency is a realistic and affordable component to implement into any new home project. With this program we hope that someday homes like the Efficiency Nova Scotia Demonstration Homes will be the most viable option for homeowners in the province.

With the program incentives such as the Performance Plus program, building energy efficient homes is now within reach. We are constantly working to ensure that energy efficiency an affordable reality in Nova Scotia and our mix of programs and incentives are designed to encourage homeowners, builders and architects to create homes that are efficient.

Building homes that generate savings for the homeowner month after month and year after year simply makes sense.



The Efficiency Nova Scotia Demonstration Homes blend nicely with other homes in their communities but the value makes them stand out.

Changes for the better are achievable and within our reach and the Efficiency Nova Scotia Demonstration Homes prove that to us. These homes are truly a source of inspiration for all Nova Scotians and I hope that one day they become a norm in our communities.

Thank you for visiting these homes and enjoy your tour.

a message from

Paul Pettipas

CEO, NOVA SCOTIA HOME BUILDERS' ASSOCIATION

As the cost of energy rises, homeowners need to explore different ways to conserve energy to lower their monthly costs. Programs like the Efficiency Nova Scotia Demonstration Homes are designed to educate Nova Scotian home builders about the latest technology in energy efficient home construction. These homes represent the future of the residential construction industry and with them we hope to start a new trend in environmental initiatives.

From an environmental perspective, these homes will greatly reduce their owners' carbon footprint while saving the owners money. As a long-term investment, these homes will continue to save their owners money as the cost of energy continues to rise in the future.

While these homes are slightly more expensive to build, the



incremental savings incurred over time are well worth the initial investment. The owners of these homes will notice a substantial difference in energy costs from the first time they receive their energy bill.

In conclusion, I invite you to look around homes and witness the future of Nova Scotia home construction. Enjoy your visit and I encourage you to strongly consider energy efficiency when you are building or purchasing your next home.



EFFICIENCY NOVA SCOTIA
**DEMONSTRATION
HOMES**

BUILD SMART • LIVE RIGHT

The Future of Housing in Nova Scotia

In the fall of 2010, Efficiency Nova Scotia and the Nova Scotia Home Builders' Association (NSHBA) issued a challenge to Nova Scotian architects and home designers to design an affordable energy efficient home with a minimum EnerGuide rating of 92. Submissions came in from companies all over the province who wanted the opportunity to be a part of this new program.

After the submissions were received, a panel of experienced industry professionals with experience in the area of energy efficiency were tasked to review them and choose a winner. Once the careful review process was complete they awarded the winning submission to Denim Home Inc. from the Annapolis Valley region. Denim's winning submission was unique because it was a versatile home that can be built on a slab on grade or with a full foundation. This impressed the judges so much they decided to build both options for the Efficiency Nova Scotia Demonstration Homes project.

Once the winning design was decided, another challenge was issued to home builders in the province to submit a proposal to build these homes in a way that is affordable

to Nova Scotian homeowners. Again, submissions came in from companies throughout the province that were interested in building this home.

Denim Homes Inc. was successful in this competition as well by winning the contract to build the Sackville Home using the slab on grade option. Whitestone Builders submitted the winning contract to build the Dartmouth Home with the full foundation option. In addition to being recognized for their achievements, both of these companies were given a unique opportunity to showcase their skills and work with the latest technology in energy efficient home construction.

Despite a damp start to the summer, construction of these homes began in early June and both teams have been diligently working on the program each and every day. Throughout the construction period, representatives from Efficiency Nova Scotia and the NSHBA were on hand to document each phase of the build and showcase it to the public through a variety of marketing strategies.

All progress has been updated on our dedicated website, **www.demonstrationhomes.com**, as well as Flickr, YouTube, Facebook, Twitter and through traditional media channels.



A rendering of the winning design for the Efficiency Nova Scotia Demonstration Homes, submitted by Denim Homes.



While construction was underway, the program attracted a great deal of publicity and high profile visitors. Mayor Peter Kelly visited the Sackville Home in early July to witness how the home was being constructed during its early stages. In mid-August, a press conference was held at the Dartmouth Home to officially launch the website and kick off the program. Since the beginning of the program, the homes have appeared in the Chronicle Herald and its weekly homes feature, Homes Etc., the Halifax Metro News and it has been covered on the Global Maritimes evening news, as well as on allNovaScotia.com.

As part of the program, the builders were required the homes to be completed by October 1st so they can be open to the public for an eight-week viewing period.

During these eight weeks, industry professionals, construction students, current and potential home owners and the general public are invited to come view the homes or take a tour. By doing this, the program is designed to educate Nova Scotians about the simplicity and affordability of energy efficient home construction.

The Efficiency Nova Scotia Demonstration Homes is a program designed to serve as a benchmark of energy efficiency for all home builder and designers. These homes represent a new era for the residential construction. The Efficiency Nova Scotia Demonstration Homes will be a benchmark for Nova Scotians to help show them how to reduce the size of their carbon footprint while saving them money on energy costs each and every month.



R-2000: Giving back to Homeowners

Energy efficient homes constantly reduce their owner's carbon footprint and save them money from the day they are complete. Not only do energy efficient homes save money in energy costs through their lifespan but some homes actually qualify for Performance Plus rebates if they meet the required EnerGuide standard.

PerformancePlus Program

In Nova Scotia, based on the building code, a home following the performance path must reach an EnerGuide rating of 80. Made available to anyone building a new home in the province, PerformancePlus is Nova Scotia's home energy efficiency program. While only available for a limited time, this program provides specific recommendations to help one make more informed choices when building a new home. The program's goal is to encourage Nova Scotians to build energy efficient homes. Rebate amounts increase based on the home's energy performance. The higher the home's EnerGuide rating, the more efficient the home.

What is the EnerGuide Rating System?

EnerGuide is an energy scale used to measure the efficiency of new homes and all R-2000 homes must have a minimum rating of 80. New homeowners qualify for monetary rebates with an EnerGuide rating above 83.

The Performance Plus rebates pertaining to an EnerGuide rating are as follows:

EnerGuide Rating	Rebate
83 and 84	\$3000
85 to 87	\$5000
88 and above	\$7000

Other mechanical systems facilitate additional rebates. In fact, monetary incentives are rebated for specific mechanical systems that are energy efficient. From having a heat pump to a programmable thermostat, all of these systems not only enable the homeowner to qualify for a rebate, but also save the homeowner money in the long run due to the decrease in one's monthly energy bill.

Some of the mechanical systems that qualify for an additional rebate include:

Mechanical System	Rebate
Heat pump	\$900-1200
Drain water heat recovery	\$130
Solar domestic hot water*	\$1250
Programmable thermostats	\$15
Efficient Lighting	\$100

* Typo corrected on January 14, 2012

Almost everyone cares about the environment and the earth we are sharing with future generations and every new home owners appreciate a few extra dollars in their pocket. Building and purchasing energy efficient homes is a valuable decision for now and the life of the home.



Performance**Plus**

EnerGuide 80 vs. EnerGuide 92+

The minimum standard for an R-2000 home is an EnerGuide rating of 80. Many homeowners work to achieve this minimum standard without considering the added benefit in exceeding it with additional energy efficient technology. The Efficiency Nova Scotia Demonstration Homes have an EnerGuide rating of a minimum of 92. Those extra 12 points will make a substantial difference when it comes to long-term savings.

A home's EnerGuide rating determines its energy efficiency which lowers the homeowner's monthly energy costs. The initial costs associated with building energy efficient homes such as the Efficiency Nova Scotia Demonstration Homes are higher than conventional homes but the savings incurred make it worthwhile for the homeowner.

Even without considering the initial cost benefit, energy efficient upgrades are a great way to allocate financial resources because the extra costs associated with the initial upgrades are outweighed by energy savings each and every month.

A \$10,000 energy efficient upgrade would typically add about \$30/month to the average mortgage payment. The additional mortgage costs are easily outweighed by these upgrades because if installed properly, a substantial energy efficient upgrade will save the homeowner approximately \$50/month in energy costs. This theoretical upgrade will save the homeowner approximately \$20 each and every month which equals an annual savings of \$240. This proves that energy efficient upgrades are a smart investment even though the initial cost can be substantial.

Homes similar to the Efficiency Nova Scotia Demonstration Homes have multiple systems that are often complex and expensive which deter homeowners from incorporating them into their new home projects. While these systems are costly to purchase and install, each one continuously contributes to the overall energy savings of that home which saves the owner money.

Anyone who has prepared a monthly or annual budget will have an understanding that energy costs consume a considerable amount of financial resources. Energy efficient home construction is designed to minimize these expenses. As energy costs continue to increase these continuous savings will increase as time goes on.

While increased financial savings are enough to encourage future homeowners to consider building energy efficient homes, they must also consider the environment when doing so. Energy efficient homes are designed to help the environment by minimizing the amount of energy consumption in the home. They also encourage green-living by minimizing the homeowners' carbon footprint.

By buying or building an energy efficient home like the Efficiency Nova Scotia Demonstration Homes, you are making a sound investment, both in a quality home with long-term savings and in the environment's future.



A blower door test measures the air exchange rate in a home, a key component in testing the air-tightness of the structure and contributes to determining a home's EnerGuide rating.

Demonstration Home Profile:

EnerGuide Rating: **94**

Location:

37 Viridian Drive
Willow Ridge Subdivision
Dartmouth, NS

Directions:

Woodland Ave off Hwy 111, to
Lancaster Drive, first right on
Cannon Terrace, right on Viridian.

Home Style:

2 Story with basement

Living Space: 3300 sq.ft

Bedrooms: 3 + 1

Bathrooms: 3 + 1/2

Dartmouth



Built By

White Stone

www.whitestonedevelopments.com

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About the home...

The Efficiency Nova Scotia Demonstration Home in Dartmouth is a single family detached home located on a corner lot on Viridian Drive in the Willow Ridge subdivision. This four-bedroom, 3 1/2 bathroom R-2000 home has more than 3,300 square feet of living area on 3 finished levels.

This demonstration home is built on a foundation that is complete with a basement and one-car garage. The extra space in the home allows for an additional bedroom, bathroom and media or multi-purpose room. There is a natural gas fireplace in the main living room to keep the owners warm during the cold winter months. Additionally, a walk-in pantry in the corner of the kitchen will provide additional storage of food and other housewares.

The Dartmouth Home has all of the comforts of a conventional house with all the added benefits of an energy efficient design, featuring:

Mechanical Systems:

- An air source heat pump with natural gas backup
- 16 photovoltaic (PV) solar panels
- 2 solar thermal panels for domestic hot water

Insulation:

- Foundation: R24
- Exterior Walls: R35 - dry blown cellulose insulation over 10" walls with staggered 2"x4" vertical studs
- Attic: R60 - cellulose (recycled paper) insulation

Additional Features:

- Triple glazed windows (facing south)
- A drain water heat recovery (DWHR) system
- Comprehensive automated monitoring system
- Natural gas hookup for appliances and fireplace
- Cork flooring and SmartStrand carpet
- Mechanical shutters
- CFL and LED Lighting
- Instant hot water system in kitchen

Demonstration Home Profile:

EnerGuide Rating: **96**

Location:

111 Hanwell Drive
Sunset Ridge Subdivision,
Lower Sackville, NS

Directions:

Travel Hwy 101 to Margeson Drive
Exit 2A, turn right on Swindon Drive,
left on Hanwell.

Home Style:

2 Story on slab

Living Space: 2300 sq.ft

Bedrooms: 3

Bathrooms: 2 + 1/2

Sackville



Built By

About the home...

Located in Lower Sackville, this Efficiency Nova Scotia Demonstration Home is a two-level, single family dwelling located on Hanwell Drive in the newly developed Sunset Ridge subdivision. This elegant home is 2,304 square feet, featuring an open concept layout with 3 bedrooms and 2 1/2 bathrooms.

The main floor is built on an 8" engineered slab featuring a 6" layer of foam beneath the slab with a modern acid-stained finish on top. It also features four solar thermal panels heating water: two panels for domestic hot water and two for in floor heating, where water flows through a series of heating pipes installed in the concrete floor. 20 photovoltaic solar panels are also installed on the roof to generate electricity.

Both homes are based on the award-winning design by Denim Homes Inc. A few features of the Sackville Home are:

Mechanical Systems:

- An air source heat pump
- 20 photovoltaic (PV) solar panels
- 2 solar thermal panels for domestic hot water
- 2 solar thermal panels for in-floor heating



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Insulation:

- Foundation: R25 - type 3 expanded foam under slab
- Exterior Walls: R42 - wet sprayed cellulose insulation with 1" foil faced foam over 10" walls with staggered 2"x4" vertical studs
- Attic: R60 - cellulose (recycled paper) insulation

Additional Features:

- Triple glazed windows
- A drain water heat recovery (DWHR) system
- Recycled quartz countertops
- Comprehensive automated monitoring system
- Integrated/mobile lighting and electrical control
- CFL lighting
- Acid-stained concrete (slab) flooring on main level

Inside the Demonstration Homes...

Wall Design

Both Efficiency Nova Scotia Demonstration Homes are built with a unique wall design that creates a complete thermal break between the interior and exterior of the home. The wall structure is built with 2"x10" top and bottom plates and staggered 2"x4" vertical studs on the inside and outside edges of the wall. As a result, the walls are thicker than those used in conventionally-built homes.

By staggering the studs there is no place for heat to be conducted to the outside of the home and likewise cold air to the inside of the home, thus creating an envelope that completely protects the inside of the home from the elements. The additional area inside the wall cavity creates more room for thermal insulation as well.

In addition to the fibrous or spray-foam insulation, boardstock insulation can still be applied either on the interior or exterior surface, spanning across the framing. By providing boardstock insulation, there is virtually no chance of



moisture condensing within the wall cavity. Moreover, large window ledges have also been installed in the homes. These large window ledges not only create connectivity to the outdoors but are also aesthetically appealing and a great spot to grow plants and vegetables.

Windows

The windows installed in the Efficiency Nova Scotia Demonstration Homes contribute to the overall R-value of the home, in turn adding to the homes' energy efficiency.

Most are triple glazed/paned, low-E argon windows. These windows are installed on the north side of the home to maintain an air tight envelope. They are only installed on the north side of the home because they receive the least amount of exposure to the sun. By installing triple glazed windows the heat generated from the home's internal heating system is contained within the home.

Double glazed/paned, low-E argon windows are installed on the south, east and west sides of both homes to maintain the air-tight envelope while taking advantage of solar heat entering the home through these windows. The south side of the home receives the most exposure to the sun throughout the day, therefore it is always collecting and containing heat from the sun. The outer edges are properly sealed



with aerosol spray foam that expands inside the crevices to ensure that the home maintains its air-tight envelope. Most of the windows are tilt and turn style which have a superior seal and dual function as they also have the ability to open both fully or partially.

Inside the Demonstration Homes...

Wall Insulation

The Efficiency Nova Scotia Demonstration Homes are insulated with a fibrous material known as cellulose, made completely out of recycled materials. Cellulose is mostly comprised of recycled newsprint and fire retardant materials.

It is the same material used in most conventionally-built homes to insulate the attic and roof, however, both demonstration homes feature ways to use it to insulate the walls. Read below to see how each home does this:

Wet-type cellulose insulation



In the Sackville Home, wet-type cellulose insulation was sprayed into all wall cavities. This type of insulation mixes the cellulose with a liquid similar to glue as it is sprayed into the wall. The binding agent dries and hardens cellulose in the wall cavities to create an air-tight seal around all of the exterior walls.

Once the wet-type cellulose insulation dries, a one-inch thick foil faced foam is attached to the interior wall before installing drywall. The foam provides added insulation (R7 value) while sustaining a vapour barrier between the outside and inside of the home.

Dry-type cellulose insulation



In the Dartmouth Home, a dry-type cellulose insulation was used to insulate the wall cavities. For this application, a thin sheathing is stapled to the interior of the wall structure to contain the insulating material. The insulator then cuts two small holes (top and bottom) in each wall cavity and the dry cellulose is sprayed in. The sheathing effectively holds the insulation in place, while allowing it to be properly blown into all sections of the wall cavity.

Once the wall cavities are filled with dry-type insulation, a thick plastic vapour barrier is attached to the interior wall before installing drywall.

Inside the Demonstration Homes...

Drain Water Heat Recovery

In the Efficiency Nova Scotia Demonstration Homes even the drain water contributes to their energy efficiency. The heat from all drain water is used to further heat the domestic water supply in the home. This simple system is called a drain water heat recovery system and it simply routes the drain water from the showers, washer, sinks and dishwasher through a 60-inch copper pipe that is wrapped by the domestic water supply line. The heat from the drain water is conducted through the exterior of the supply line to heat the domestic water supply.

By using the drain water heat recovery system, the home eliminates any added energy costs that would be required to further heat the water. The drain water heat recovery system is just one more system that works to reduce the amount



of energy used by the future home owners. In the Efficiency Nova Scotia Demonstration Homes, the drain water doesn't stop working until it reaches the sewer.

Solar Hot Water

Another great feature of the Efficiency Nova Scotia Demonstration Homes is the solar boiler domestic hot water system, which uses solar energy to heat the potable water used in the homes for showers, sinks, laundry, dishes and other water needs.

Both homes are fitted with solar panels on the roof that have exposed water pipes to them. As the water passes through these pipes the sun's energy heats the water before it is stored in an insulated storage tank in the homes' mechanical room. Each set of panels is fitted with a small photovoltaic (PV) panel. The solar energy generated by this panel powers a pump that circulates the water to and from the panels on the roof.

The system is also fitted with a standard hot water tank that is used to supplement the solar boiler system. This traditional system acts only as a back up to the solar boiler domestic hot water system and is used on a minimal basis.



The Sackville Home is fitted with piping in the floor that serves as an in-floor radiant heat system. All of the excess water that is heated by the system is sent into the floor to provide added heating comfort to the homeowner.

Inside the Demonstration Homes...

Air Source Heat Pump

The primary heating systems used in the Efficiency Nova Scotia Demonstration Homes is an air source heat pump. This versatile and energy efficient system will heat the homes during the winter months and cool it during the summer months.

It is closed system, meaning that fresh air is only circulated through the home via the heat recovery ventilator, that continuously recirculates air. This efficient system is comprised of a heat exchanger, a refrigeration compressor and a ventilation system.

The system utilizes a refrigeration compressor to heat and cool the heat exchanger because it has the ability to heat at sub-zero temperatures. The heat exchanger sustains the optimum operating temperature by an outdoor unit that passes fresh air over the heating coil. In the winter, the warm

air is dispersed through the home to the desired temperature of the occupant. In the summer, the system runs in reverse and the outside air is cooled by the heat exchanger.

Once the air is adjusted to the desired temperature it is carried throughout the home using a high-efficiency ventilation fan and a series of ventilation pipes. Throughout the year, the temperature of the homes are controlled by a digital programmable thermostat.

All fridge compressors are versatile in the sense that they can heat and cool. Air source heat pumps take advantage of this versatility to serve the homeowners' needs in all four seasons, making the air source heat pump the most appropriate system to control the temperature in the Efficiency Nova Scotia Demonstration Homes.

Energy Monitor

While the future owners of the Efficiency Nova Scotia Demonstration Homes will see how efficient their homes are by the size of their monthly energy bill, that will not be the only way it will be observed. Both homes will have a digital energy meters installed directly into the homes' electrical service that read how much power is being used by the occupants and how much is being generated by the homes' renewable energy systems.

Energy consumption and production works comparably to an account balance of a bank account. Consumption is similar to a withdraw transaction that is drawn from the residential power grid. Production, on the other hand, is comparable to a deposit or credit to the account that the home gives back to the residential power grid.

The homes' energy monitors keep track of the energy balance sheet so the homeowner can observe how much power they are generating or drawing, creating a visual representation of their balance.



If the homeowner uses the homes' energy efficient systems responsibly, they could potentially produce more renewable energy than what is required to operate the home. When this happens the homeowners will receive a credit from Nova Scotia Power Inc. While they are not entitled to financial compensation, they are allowed to use that credit at different times throughout the year.

Inside the Demonstration Homes...



PhotoVoltaics

To help mitigate the high cost of electricity, 16 photovoltaic (PV) panels have been installed on each of Efficiency Nova Scotia Demonstration Homes. The panels have been placed as close to true south as possible to optimize solar gain.

The PV panels are the homes' primary renewable energy system and they help reduce energy costs. These panels are installed on the roof to collect solar energy that is converted into electricity and sent back to the residential power grid. The electricity that is drawn from the residential power grid to operate these homes is subsidized by the energy collected

by the PV panels. All of the PV panels are connected to the homes' electrical service.

In preparation for the added weight, the sloped roof trusses of the homes were specially engineered to safely support the PV panels

If the PV panels generate more energy than what is used to operate the home the future owners will receive a credit from Nova Scotia Power instead of an energy balance. Depending on the number of occupants and power used in the home, these PV panels could potentially eliminate all monthly costs associated with electricity.

Aging-in-Place

As more homeowners from the baby boomer era are retiring and choosing to stay in their homes well into their golden years, many are opting to purchase or build retirement homes instead of occupying assisted living facilities. While this trend continues to grow amongst our aging population, another trend is taking place in the residential construction industry to help facilitate this shift in needs.

Presently, there is a rise in the number of homes that are designed to grant all of the owners' needs for the future. Many designs are following open concept models with a large open space and wider hallways. Some homes are built to accommodate the homeowners' needs on one singular level, others have space for elevators and stair lift systems, while some have more subtle features such as lever handles on doors and push button light switches. While many of these homes are designed to facilitate the needs of aging Nova Scotians, some support systems can be quite costly if

included after the construction phase. One of the most effective ways to make the best use of pension dollars is to invest in energy efficient home construction.

Energy efficient homes, like both of the Efficiency Nova Scotia Demonstration Homes, show that homes can accommodate our aging population while positively impacting the environment. Both the Efficiency Nova Scotia Demonstration Homes are designed and built with the future mobility needs in mind. For instance, both of the homes feature wider doorways and unique kitchen designs to make daily living and cooking more accessible. Additionally, the home built by Denim Homes has a room on the main floor that can be easily transitioned into a bedroom to eliminate the difficulty that stairs can bring in terms of accessibility.

With many choosing to live an active and healthy lifestyle at home in their future, and with the increase in people choosing to live in their homes longer, having options available at the time of construction provides homeowners with new opportunities.

Inside the Demonstration Homes...

Water and power conservation

In addition to the major energy-efficient elements listed in this booklet, there are various other upgrades that the Demonstration homes feature.

To help the homeowners save electricity is an energy control switch. With a touch of a button, the homeowners are able to turn off any lights they may have forgotten to turn off, thus benefiting both the homeowners and the environment.

To help the homeowner conserve water usage, low-flow shower heads, toilets and faucets have been installed - which in fact are the most effective for water conservation. Recognizing that 28-percent of household water is used by the toilet alone, it is easy to see how these products can reduce water use by more than 30 percent.

It all starts with the right Design

By Denim Homes
Demonstration Home Designers

There are many things to consider when designing and building an energy-efficient home. The building site conditions and the overall design have a huge bearing on the materials and assemblies used in construction. Not one foundation type or wall is the right choice for every home.

Energy efficient homes can be designed to look great and fit in any urban setting. Improvements in building technology and construction techniques allow most modern energy-saving ideas to be seamlessly integrated into home designs, while improving comfort, health and aesthetics. And it doesn't have to be expensive or complicated. While design costs, options, and styles vary, most energy-efficient homes have some basic elements in common: a well constructed and tightly sealed thermal envelope; controlled ventilation; properly sized, high-efficiency heating and cooling systems; and energy-efficient doors, windows, and appliances.

Come experience the future of residential housing in Nova Scotia!

The **Efficiency Nova Scotia Demonstration Homes** are being hailed as the most energy-efficient residential homes in the province! Come see for yourself the construction techniques, products and components that combine to give these homes the best energy rating currently on the market.

Dartmouth Home

Willow Ridge Subdivision,
37 Viridian Dr., Dartmouth

Take Woodland Ave off Hwy 111,
to Lancaster Drive, first right on Cannon
Terrace, right on Viridian Drive

Sackville Home

Sunset Ridge Subdivision,
111 Hanwell Dr., Lower Sackville

Travel Hwy 101 to Margeson
Drive Exit 2A, turn right on Swindon Drive,
left on Hanwell Drive.

**Open to the public on Saturdays & Sundays 1-4 pm
October 1 - December 11**

For location maps and further information see our website



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Create a more Energy Efficient Nova Scotia

Here are a few ways we can help

Appliance Retirement Program

Do you have an inefficient second fridge? Perhaps an old freezer, dehumidifier or room air conditioner? We'll pay you for your old, inefficient appliances.

Building a New Home?

We offer rebates for energy efficiency measures. Get access to valuable energy analysis tools and rebates on your new home when you build with energy saving measures.

EnerGuide for Existing Houses

Are you a homeowner looking to save money on your heating and power bill? If so, the EnerGuide for Existing Homes may be for you. You get access to valuable energy analysis tools and can earn rebates worth up to \$6500 when you make energy efficiency upgrades.

Fuel Substitution

This program has been extended to Dec. 31, 2011!

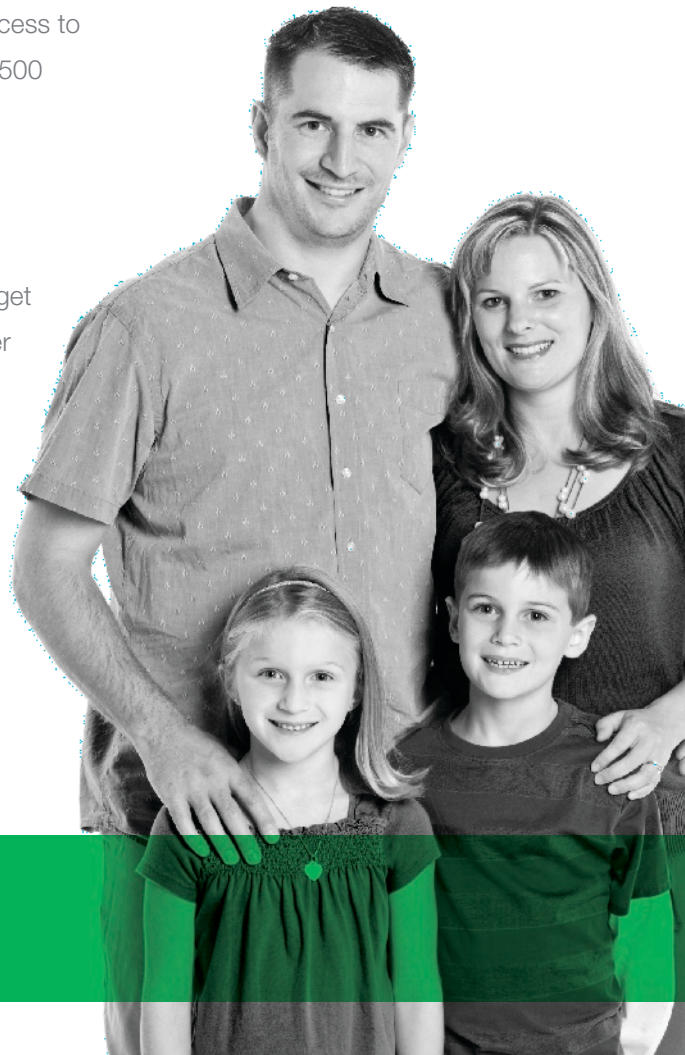
Apply now to help reduce your electricity bill. Whether you want to get off electric heat altogether or just want to supplement it with another energy source, earn rebates and save money by switching from electric to wood burning and pellet burning heat or natural gas.

Efficiency Nova Scotia is committed to providing energy saving to Nova Scotians.

Contact us to find out how we can help you save money on your power bill. It's easy. So why not do it now?



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